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VOLUME 74

Proceedings of the American Academy of Arts and Sciences

Vol. 74, No. 6, P. 91–192—November, 1940

RECORDS OF MEETINGS

One Thousand Two Hundred and Forty Eighth Meeting

OCTOBER 19, 1938—STATED MEETING

The Academy met at its House at 8.35 P. M.

The President in the Chair.

There were present sixty-one Fellows and seven guests.

The records of the meeting of May 11 were read and approved.

The Fellows elected in May were then presented to the Academy.

The Corresponding Secretary reported the receipt of letters from the Societas Scientiarum Fennica, the Franklin Institute and Greensboro College expressing appreciation of the Academy's sending delegates or greetings to their celebrations.

He also announced that the President had appointed the following delegates:

Professors H. B. Phillips and Philip Franklin to the Semicentennial Celebration of the American Mathematical Society, at New York City, on September 6–9, 1938;

President D. C. Jackson to the Installation of Edwin Sharp Burdell as Director of Cooper Union, New York City, on November 3;

Dr. A. C. Lane to the Inauguration of Leonard Carmichael as President of Tufts College, on November 4.

It was also reported that the following invitations had been received, to which the Academy had responded by sending greetings:

Semi-Centennial Celebration of Utah State Agricultural College, Logan, June 5–7, 1938;

Inauguration of Charles Burgess Ketcham as President of Mount Union College, Alliance, Ohio, October 20, 1938;

Inauguration of William Harold Cowley as President of Hamilton College, Clinton, N. Y., October 29, 1938.

The Corresponding Secretary reported the receipt of a letter resigning Fellowship from Morris B. Lambie, and of one resigning membership in the Council from Lawrence J. Henderson, which had been accepted with regret.

He announced that the Council had made the following grants from the Permanent Science Fund:

1. To Prof. D. C. Carpenter, New York State Experiment Station, Geneva, $300, toward the purchase of optical equipment for an investigation of the effect of neutral salts on amino acids and proteins.

2. To Dr. V. I. Cheadle, Instructor in Botany, Rhode Island State College, Kingston, $300, toward the cost of technical assistance in the preparation of material for the study of the conductive system in a group of the Monocotyledonae.

3. To Dr. S. R. Gifford, Northwestern University Medical School, Chicago, $500, toward the cost of technical assistance in a study of the relation of the physical change of protein molecules in cataract of the eye.

4. To Prof. W. L. Gilliland, University of Maine, Orono, $250, toward the purchase of precision equipment for use in studying certain equilibria in Grignard reagents.

5. To Prof. F. L. Humoller, Loyola University School of Medicine, Chicago, $400, toward the cost of animals and materials in a study of the chemistry of a toxic fraction prepared from Salmonella enteritidis.

6. To Dr. Valy Menkin, instructor in Pathology, Harvard Medical School, Boston, $500, toward the cost of an investigation of the nitrogenous substances in areas of injury.

7. To Prof. Gregory Pincus, Clark University, Worcester, $800, for technical assistance and supplies in the further study of the development of artificially activated mammalian ova *in vivo* and *in vitro*.

8. To Prof. G. W. Prescott, Albion College, Albion, Mich., $175, toward the expenses of an investigation of phytoplankton in the Panama Canal Zone.

9. To Prof. Christianna Smith, Mount Holyoke College, South Hadley, $200, for the purchase of animals in a study of the origin and differentiation of red blood corpuscles.

10. To Dr. Oswald Tippo, Instructor in Botany, University of Illinois, Urbana, $75, for

the cost of text figures necessary for the effective publication of a monograph on the Moraceae.

11. To Prof. Dorothy W. Weeks, Wilson College, Chambersburg, Pa., $500, for technical assistance in extension of the analysis of the spectrum emitted by neutral iron atoms.

The Corresponding Secretary announced the receipt of letters accepting election as Fellows from Henry Moore Bates, Marland Pratt Billings, Julius Seelye Bixler, Emile Monnin Chamot, James Pyle Wickersham Crawford, Edmund Ezra Day, Alfred Victor de Forest, Robert Gray Dodge, John Charles Duncan, Allyn Bailey Forbes, Horace Sayford Ford, James Everett Frame, Claude Moore Fuess, Frank Washburn Grinnell, Robert Casad Hockett, Joseph Hudnut, E. Morton Jellinek, Melvin Maynard Johnson, Howard Mumford Jones, James McCauley Landis, John Moyes Lessells, Stewart Mitchell, James Madison Morton, Hyder Edward Rollins, Bernadotte Everly Schmitt, Charles Seymour, Kenneth Vivian Thimann, Harold Clayton Urey, Bentley Wirt Warren, Thomas North Whitehead, Grenville Lindall Winthrop, George Bernays Wislocki; and of letters accepting Foreign Honorary Membership from Edgar Douglas Adrian, Dionisio Anzilotti, Sir Joseph Barcroft, William Warwick Buckland, Mircea Djuvara, Emmanuel Fauré-Frémiet, Arthur Lehman Goodhart, Rt. Hon. Lord Macmillan, Leopold Ruzicka, Nevil Vincent Sidgwick, Kenzo Takayanagi, Georges Urbain, Rt. Hon. Lord Wright; also a letter from Henry Sloane Coffin declining Fellowship.

The President announced the death of eleven Fellows: Ernest William Brown (Class I, Section 1), William Wallace Campbell (Class I, Section 1), Benjamin Nathan Cardozo (Class III, Section 1), Thomas Hovey Gage (Class III, Section 1), Nathaniel Thayer Kidder (Class III, Section 4), Elmer Peter Kohler (Class I, Section 3), Andrew James Peters (Class III, Section 4), Arthur Prentice Rugg (Class III, Section 1), Edmund C. Tarbell (Class IV, Section 4), Frank Bursley Taylor (Class II, Section 1), Owen Wister (Class IV, Section 4); and of one Foreign Honorary Member: Joseph Bédier (Class IV, Section 3).

The following communication was presented:

Mr. George Howard Parker: "Modern Views on the Action of the Nervous System as Illustrated by the Color Changes of Animals," illustrated with lantern slides.

Four papers were read by title: "Chang Po-Tuan of T'ieu T'ai, his Wu Chên P'ieu, Essay on the Understanding of the Truth," by T. L. Davis and Chao Yün-Ts'ung; "Gyromagnetic Ratios for Ferromagnetic Substances: New Determinations and a New Discussion of Earlier Determinations," by S. J. Barnett; "Some Physical Constants of a Few Hydrocarbons and their Structural Isomers," by M. Wojiciechowski, presented by F. G. Keyes; "Interatomic Forces and Helium in Rocks," by N. B. Keevil, presented by R. A. Daly.

The meeting was dissolved at 9.45 P. M.

One Thousand Two Hundred and Forty Ninth Meeting

NOVEMBER 9, 1938—STATED MEETING

The Academy met at its House at 8.30 P. M.

The President in the Chair.

There were present forty-nine Fellows and five guests.

The records of the meeting of October 19 were read and approved.

The Corresponding Secretary announced the appointment of Professor Tenney L. Davis to fill out the unexpired term on the Council of Professor L. J. Henderson.

He also announced his own resignation as Corresponding Secretary and the appointment of Professor Abbott P. Usher to fill out his term.

He reported that the Council had reappointed Professor J. D. M. Ford for four years as a delegate from the Academy to the American Council of Learned Societies.

The Corresponding Secretary reported the receipt of letters accepting Fellowship from Richmond Laurin Hawkins and William Morton Prest, and a letter from Professor Ulrich Wilcken, of Berlin, expressing regret that he had been refused official permission to accept his election as a Foreign Honorary Member of the Academy.

He also reported the receipt of a letter from Hamilton College expressing appreciation for the greetings sent by the Academy on the occasion of President Cowley's inauguration.

The President expressed regret for the resignation of Professor Leigh Hoadley as Corresponding Secretary, made necessary by his absence from the country during the next few months.

The President announced the death of Maurice d'Ocagne, Foreign Honorary Member in Class I, Section 4.

The following communication was presented:

Mr. George Sarton: "The Function of Academies—Past and Present."

The meeting was dissolved at ten P. M.

One Thousand Two Hundred and Fiftieth Meeting

DECEMBER 14, 1938—STATED MEETING

The Academy met at its House at 8.25 P. M.

The President in the Chair.

There were present thirty-one Fellows and nineteen guests.

The records of the meeting of November 9 were read and approved.

The Corresponding Secretary reported that the Council had approved the following proposed amendments to the Statutes, which had been recommended by the Special Committee on Academy Policy:

1. Addition to Chapter II, Article 5, after Paragraph 2: "Fellows resident outside fifty miles of Boston shall pay annual dues of five dollars, which shall entitle them to all the privileges of resident Fellows."

2. Delete Chapter XII, Article 5, which now reads: "No Fellow shall introduce a guest at any meeting of the Academy until after the business has been transacted, and especially until after the result of the balloting upon nominations has been declared."

After some discussion of the first proposed amendment, it was *Voted* to lay it on the table until the next meeting.

The motion to adopt the second amendment was carried unanimously.

The President announced the following deaths: Edward Murray East (Class II, Section 2), Edwin Herbert Hall (Class I, Section 2), William McDougall (Class IV, Section 1), George Burgess Magrath (Class II, Section 4), Charles Edward Munroe (Class I, Section 3), John Charles Phillips (Class II, Section 3), and Georges Urbain, Foreign Honorary Member in Class I, Section 3.

The following communication was presented:

Mr. Hudson Hoagland: "Some Aspects of Electrical Brain Waves," with lantern illustrations.

The meeting was dissolved at 10 P. M.

One Thousand Two Hundred and Fifty First Meeting

JANUARY 11, 1939—STATED MEETING

The Academy met at its House at 8.25 P. M.

The President in the Chair.

There were present forty-seven Fellows and ten guests.

The records of the meeting of December 14 were read and approved.

The Corresponding Secretary reported that the Council had voted to recommend to the Academy an amendment to the Statutes which would provide for a Standing Committee on Resources, to be made part of the order of business at the next meeting.

The President announced the death of William MacDonald, Fellow in Class III, Section 2.

The proposed amendment to the Statutes requiring that Fellows residing more than fifty miles from Boston should pay annual dues of five dollars was then brought before the Academy.

An amendment to this amendment was proposed that all future Fellows residing more than fifty miles from Boston shall be so charged, but that present Fellows of this group be exempted.

After some discussion this amendment to the proposed amendment was voted.

A ballot was then taken on the original amendment as amended, *i. e.*, Fellows residing more than fifty miles from Boston elected after 1938 shall, and other non-resident Fellows may, pay annual dues of five dollars, which shall entitle them to all privileges of resident Fellows.

This was affirmatively voted by a ballot of thirty-five to ten.

The following communication was presented:

Dr. Alexander Forbes: "Aerial Photography and Map Making," illustrated with lantern slides.

The meeting was dissolved at 10.10 P. M.

One Thousand Two Hundred and Fifty Second Meeting

FEBRUARY 8, 1939—STATED MEETING

The Academy met at its House at 8.25 P. M.

The President in the Chair.

There were present thirty-five Fellows and four guests.

In the absence of the Recording Secretary Mr. Tenney L. Davis was asked to assume his duties.

The records of the meeting of January 11 were read and approved.

The President announced the death of four Fellows: Fabian Franklin (Class I, Section 1), Edward Sapir (Class IV, Section 2), Albert Sauveur (Class I, Section 4) and Frank Edward Winsor (Class I, Section 4).

It was *Voted*, that the Committee on Policy is authorized to recommend changes in the Statutes establishing a Committee on Resources.

The following communication was presented:

Mr. Charles M. Spofford: "Contribution on the Development of Bridges and Similar Structures from Ancient Times, with Consideration of the Religious, Political, Artistic, Scientific and Economical Factors which have Influenced their Construction," illustrated with lantern slides.

The meeting was dissolved at 10.15 P. M.

One Thousand Two Hundred and Fifty Third Meeting

MARCH 8, 1939—STATED MEETING

The Academy met at its House at 8.30 P. M.

The President in the Chair.

This meeting having been designated as Ladies' Night, there were present about 150 Fellows and guests.

In the absence of the Recording Secretary the reading of the records of the meeting of February 8 was omitted.

On the recommendation of the Council the following appropriations were voted for the ensuing year:

From the income of the General Fund, $7,200, to be used as follows:

for General and Meeting expenses	$ 900
for Library expenses	2,100
for Books, Periodicals, and Binding	1,200
for House expenses	2,000
for Treasurer's expenses	900
for President's expenses	100
	$7,200

From the income of the Publication Fund, $3,000, to be used for publication.

From the income of the Rumford Fund, $2,800, to be used as follows:

for Research	$2,000
for use at the discretion of the Committee	800
	$2,800

From the income of the C. M. Warren Fund, $900, to be used at the discretion of the Committee.

The Corresponding Secretary read a letter resigning Fellowship from Associate Justice Felix Frankfurter; also a letter of acceptance of Foreign Honorary Membership from Dr. Heinrich Brüning.

The President announced the death of two Fellows: Herbert Parker (Class III, Section 1) and Edmund Beecher Wilson (Class II, Section 3); and one Foreign Honorary Member: Sören Peter Lauritz Sörensen (Class I, Section 3).

The President announced that the following Fellows were appointed to serve as a Nominating Committee:

Tenney L. Davis, of Class I
S. Burt Wolbach, of Class II
Ralph E. Freeman, of Class III
Walter E. Clark, of Class IV

The President introduced the speaker of the evening, Mr. S. Foster Damon, of Brown University, who read a poem from manuscript, "The Fatigue of Burgwine."

The meeting was dissolved at 9.45 P. M.

One Thousand Two Hundred and Fifty Fourth Meeting

APRIL 12, 1939—STATED MEETING

The Academy met at its House at 8.23 P. M.

The President in the Chair.

There were present sixty-seven Fellows and seven guests.

The records of the meetings of February 8 and March 8 were read and approved.

The Corresponding Secretary announced that the Council had made the following grants from the Permanent Science Fund:

1. To Professor Emil Bozler, of the Department of Physiology, Ohio State University, for the purchase of apparatus to be used in a study of action potentials of smooth muscle, $250.

2. To Dr. Donald E. Cameron, Professor of Neurology and Psychiatry, Albany Medical College, for the purchase or construction of apparatus, as specified, to study the change in response to repetition of an unpleasant situation in psychotic patients, $200.

3. To Professor William H. Cole, Department of Physiology and Biochemistry, Rutgers University, for technical assistance, materials and

special apparatus for the determination of the chemical composition of the bloods of invertebrates, $500.

4. To Professor Robert S. Harris, Department of Biology, Massachusetts Institute of Technology, for the purchase of a newly developed instrument for optical quantitation of Vitamin B_1, for a study of the daily requirement of young and adult individuals in respect to this vitamin, $400.

5. To Dr. Caryl P. Haskins, Union College, Schenectady, N. Y., to aid in the construction of apparatus for studying the effects of proton bombardment of spores, $500.

6. To Professor Charles E. Lane, University of Wichita, Kansas, for technical assistance and materials in a study in the relationship between the pituitary, the ovary, and the estrous cycle in rats, $300.

7. To Mr. Karl O. Lange, Research Meteorologist, Blue Hill Observatory, to aid in the construction and testing of automatic radio transmission of meteorological records to a central station, $300.

8. To Professor William J. Luyten, Department of Astronomy, University of Minnesota, as an aid in securing a supervisor for student measurements in his study of the proper motions of stars in the southern hemisphere, $500.

9. To Professor Hugh M. Raup, Harvard University, as a contribution towards general field expenses of a botanical survey of the southwestern part of the District of Mackenzie, contingent upon his securing necessary funds to assure the trip in the summer of 1939, $400.

10. To Professor Kenneth A. Siler, Department of Physiology and Pharmacology, University of Arkansas School of Medicine, for the purchase or construction of necessary instruments in an investigation of the blood flow of the coronary system, $250.

The President announced the death of Tenney Frank, Fellow in Class IV, Section 3.

The following amendments to the Statutes recommended by the Council were passed by a unanimous vote:

Chapter II, Article 6. Instead of "one copy of all Publications of the Academy" substitute "one copy of all numbers of the Proceedings and Memoirs of the Academy which have been issued," etc.

Chapter II, Article 7. Strike out the words "on request."

Chapter III. In the paragraph, "Notice shall be sent," etc., substitute "first" for "fifteenth" of February. After this paragraph insert the paragraph, "The Corresponding Secretary shall, on the second of February, transmit to the several Vice-Presidents the nominations for Fellows and Foreign Honorary Members in their respective classes. Each Class Committee shall, before the sixteenth of February, consider the nominations, and may add others for the purpose of securing proper membership in the Academy, to the end that those in the country of highest distinction in their several classes may be Fellows."

Chapter IV, Article 1, paragraph 3, to be amended to read as follows: "The Councillors, with the officers previously named and the Chairmen of the House Committee and the Committee on Resources and Policy, *ex officio*, shall constitute the Council."

Chapter IX. Add to Article 1, "The Editor shall select as Associate Editor one member of the Committee of Publication, and the Associate Editor shall assist the Editor in the duties of his office in such way as the two shall find most convenient."

Change Article 2 to read, "In conjunction with the Committee of Publication, the Editor," etc.

Chapter X. Remove Article 7 from this place, and add it to Section ix of Article 2 of Chapter XI, this Section to be re-numbered x. Renumber Article 8 of Chapter X accordingly.

Chapter XI. Insert a new Section ii in Article 2, and re-number the other sections accordingly. New Section ii, "*The Committee on Policy and Resources* to consist of five Fellows and the President, *ex officio*, one of the five elected members to be elected each year to serve for a term of five years, except that the five elected in 1939 shall be elected for terms of one, two, three, four, and five years respectively, the Committee to concern itself with procuring funds for the Academy, to study the activities and needs of the Academy, and to recommend, for the approval of the Council, means by which the functions and purposes of the Academy may best be fulfilled."

Article 2, Section iv, re-numbered v, change to read, "but Fellows may be supplied at half price

with volumes and with single publications which they are not entitled to receive gratis."

Article 2, Section ix, re-numbered x, strike out "six in 1933."

Chapter XII, Article 1. Strike out last paragraph and insert the following, "The Council shall have authority, as occasion may demand, to arrange additional meetings and to cancel any of the Statutory meetings, except that meetings for transacting business shall be held as required by the Statutes."

Article 5. Strike out and substitute, "Fellows may introduce guests at any of the literary or scientific meetings of the Academy."

Standing Votes. Strike out all of Section 4 and re-number accordingly.

The Communication consisted of a Symposium on "What Constitutes Social Progress," by Messrs. L. J. Henderson, C. C. Brinton, and E. B. Wilson.

The meeting was dissolved at 10.10 P. M.

One Thousand Two Hundred and Fifty Fifth Meeting

MAY 10, 1939—ANNUAL MEETING

The Academy met at its House at 8.20 P. M.

The President in the Chair.

There were present forty-two Fellows and one Foreign Honorary Member.

The records of the meeting of April 12 were read and approved.

The Corresponding Secretary announced the appointment by the Council of the two following committees for the ensuing year:

Amory Fund Committee: Messrs. Roger I. Lee, *Chairman*, Walter B. Cannon, David Cheever, Leigh Hoadley, Edward E. Tyzzer, Soma Weiss.

Permanent Science Fund Committee: Messrs. John W. M. Bunker, *Chairman*, George R. Agassiz, Gregory P. Baxter, Charles T. Brues, Hudson Hoagland, Edwin B. Wilson, S. Burt Wolbach.

The President announced the death of three Fellows: Henry Fay (Class I, Section 3), William Ebenezer Ford (Class II, Section 1), and Jacob Goodale Lipman (Class II, Section 2).

The following report of the Council was presented:

REPORT OF THE COUNCIL

Since the last report of the Council there have been reported the deaths of twenty-eight Fellows: Ernest William Brown, William Wallace Campbell, Benjamin Nathan Cardozo, Edward Murray East, Henry Fay, William Ebenezer Ford, Tenney Frank, Fabian Franklin, Thomas Henry Gage, Edwin Herbert Hall, Nathaniel Thayer Kidder, Elmer Peter Kohler, Jacob Goodale Lipman, William MacDonald, William McDougall, George Burgess Magrath, Charles Edward Munroe, Herbert Parker, Andrew James Peters, John Charles Phillips, Arthur Prentice Rugg, Edward Sapir, Albert Sauveur, Edmund C. Tarbell, Frank Bursley Taylor, Edmund Beecher Wilson, Frank Edward Winsor, Owen Wister; and four Foreign Honorary Members: Joseph Bédier, Maurice d'Ocagne, Sören Peter Lauritz Sörensen, Georges Urbain.

Thirty-seven Fellows and sixteen Foreign Honorary Members were elected by the Council and announced to the Academy in May 1938.

The roll now includes 767 Fellows and 122 Foreign Honorary Members (not including those elected in May 1939).

The annual report of the Treasurer, Horace S. Ford, was read, of which the following is an abstract:

GENERAL FUND

Receipts

Income on hand April 1, 1938		$ 1,166.00
Investments	$ 2,774.97	
Special Contributions	285.00	
Assessments and Admissions	4,280.00	7,339.97
		$ 8,505.97

Expenditures

Expenses of Library		$ 2,071.00
Books and Binding		1,590.19
General Expenses	$ 1,181.87	
Less Meetings Credits	84.75	
		1,097.12
House Expenses	$ 2,400.16	
Less Meetings Credits	240.00	
		2,160.16
President's Expenses		39.00
Treasurer's Expenses	$ 1,046.96	
Less Insurance Refund	66.87	980.09
		$ 7,937.56
Income Transferred to Principal		335.00
Accrued Interest Paid		22.38
		$ 8,294.94

Rumford Fund

Receipts

Income on hand April 1, 1938		$ 401.18
Investments		2,951.62
		$ 3,352.80

Expenditures

Research Awards, etc.		$ 1,707.00
Medal (Dr. Compton)		513.06
		$ 2,220.06
Less Receipts:		
Camera Sale	$ 30.00	
Insurance (Compton Medal)	537.06	
Harvard University (Rumford Memorial)	7.50	574.56
		$ 1,645.50
Income Transferred to Principal		143.00
Accrued Interest Paid		286.34
		$ 2,074.84

C. M. Warren Fund

Receipts

Income on hand April 1, 1938		$ 290.74
Investments		963.35
		$ 1,254.09

Expenditures

Research Awards		$ 850.00
Income Transferred to Principal		47.50
		$ 897.50

Publication Funds

Receipts

Income on hand April 1, 1938		$ 3,827.65
Appleton Investments	$ 985.98	
Centennial Investments	1,702.30	
Publication Sales, etc.	408.74	
Contribution	10.00	
Hatch Publication Fund	500.00	
Lake Fund Subscriptions	858.55	4,465.57
		$ 8,293.22

Expenditures

Publications—General	$ 2,107.62	
Publications—Lake	2,006.59	
		$ 4,114.21
Income Transferred to Principal		121.00
Accrued Interest Paid		42.90
		$ 4,278.11

Francis Amory Fund

Receipts

Income on hand April 1, 1938	$10,706.93
Investments	2,309.00
	$13,015.93

Expenditures

Publishing Statement	$ 73.10

Permanent Science Fund

Receipts

Income on hand April 1, 1938	$ 1,725.00
From Trustees	11,891.25
	$13,616.25

Expenditures

Grants	$13,304.00
Expenses	77.25
	$13,381.25

The following reports were also presented:

Report of the Library Committee

During the year 110 volumes and 33 unbound numbers of serials have been borrowed by 15 Fellows and 18 libraries, and many more have been consulted at the Academy.

The number of volumes on the shelves at the time of the last report was 45,580. During the year 459 volumes were added, making the number now 46,039. Of this 459 volumes, 383 were received by gift or exchange and 76 were purchased.

The following sum was placed at the disposal of the Librarian this year:

Balance from previous year	$ 388.23
Appropriation	3,300.00
Total	$3,688.23

The expenses charged to the Library account during the financial year ending March 31, 1939, were:

Salaries	$2,066.00
Binding	964.50
Purchase of Books and Periodicals	625.69
Miscellaneous library expenses	5.00
Total	$3,661.19

Last year I reported that the Library Committee had cancelled the subscriptions to several scientific journals in an effort to reduce the Library budget. I am happy to say that we are continuing to receive one of these, the Journal of Morphology, through the kindness of Mr. George Howard Parker.

At present we are subscribing to 40 scientific journals, and are receiving by gifts or in exchange for the Academy's Proceedings and Memoirs 800 serial publications of academies and other learned societies in North and South America, Europe, Africa, Asia, Australia and New Zealand, several of which are not to be found in any other library in Boston or Cambridge.

Respectfully submitted,

H. W. SHIMER, *Librarian*

May 10, 1939.

REPORT OF THE RUMFORD COMMITTEE

The Rumford Committee of the American Academy of Arts and Sciences has held two meetings during the year—one on April 11, 1938, and the other on January 19, 1939. At these meetings and by correspondence the members of the committee have voted the following grants:

No. 342 to Dr. Clarence Zener for the purchase of an oscillator to be used in experiments on "the connection of internal friction in solids and thermal conductivity"	$ 385
No. 343 to Dr. T. E. Sterne, Dr. R. M. Emberson, and R. Loevinger to cover a part of the expenses of the construction of automatic recording apparatus for the radiometer attached to the Wyeth reflector at Oak Ridge, Harvard, Massachusetts	290
No. 344 to Professor Frances G. Wick, Vassar College, to assist in the purchase of a spectrometer for the study of luminescence	400
No. 345 to Professor Francis Birch, Harvard University, for the study of the effect of stress upon the thermal conductivity of rocks and other materials of geological interest	400
No. 346 to Dr. G. Z. Dimitroff and H. W. French of Harvard for assistance in the development of the electron multiplier and amplifier for measurement of faint sources of light	250
No. 347 to W. M. Powell of Kenyon College for special studies in radiation	175
Total	$1,900

At the meeting on January 19 the first vote on the awarding of the Rumford Medal to Professor George R. Harrison of Massachusetts Institute of Technology was taken. A confirming vote was taken by correspondence in February.

HARLOW SHAPLEY, *Chairman*

REPORT OF THE C. M. WARREN COMMITTEE

The Committee had at its disposal during the fiscal year 1938–1939 $1,115.84, of which $850 was appropriated to aid scientific investigations.

Since the last annual report grants have been made as follows:

Professor Francis Bitter, Massachusetts Institute of Technology, $200, for the purchase of a special balance to be used in the investigation of the chemical equilibrium of alloys.

Professor Arthur F. Scott, Reed College, $200, for the purchase of a special balance to be used in the determination of the atomic weights of beryllium and fluorine.

Professor C. R. Johnson, University of Texas, $100, to be used for the purchase of apparatus required in the determination of atomic weights.

Professor Robert C. Hockett, Massachusetts Institute of Technology, $200, to be used in the preparation of certain compounds needed in the synthesis of new sugars.

Doctor William F. Ross, Radcliffe College, $150, to be used, with other grants, for the purchase of a super centrifuge required in the further study of the chemistry of hemoglobin.

Reports of progress have been received from Messrs. Huntress, Johnson, Kirk, Schmidt and Schmid.

The papers listed below, which have not been previously reported, describe the results of investigations aided by the Warren Fund.

Frederic C. Schmidt, Frank J. Studer and Joseph Sottysiak. "Heats of Solution and Heats of Reaction in Liquid Ammonia. V. The Alkali and Alkaline Earth Metals." J. Am. Chem. Soc., *60*, 2780 (1938).

Hermann Schmid, "Katalysen der Diazotierung." Angewandte Chemie, *50*, 615 (1937).

JAMES F. NORRIS, *Chairman*

May 10, 1939.

Report of the Committee of Publication

Six numbers of the Proceedings and two Fasciculi of the "Monumenta Palaeographica Vetera" have been published this year. The latter series now lacks one Fasciculus of those originally projected. Two numbers of Proceedings and one number of the Memoirs are in press.

The change to a larger format for the Proceedings, although it has, at first, increased the difficulties of preparation of manuscript for the press, has also justified itself from the financial point of view.

The balances shown below reflect the actual financial position of the Funds on 1 April, 1939, not being based on the appropriations alone.

Again, I wish to thank the Publication Committee and the authors for their cooperation.

General Fund		
Income: Sales		$ 408.74
Contributions		10.00
Expenditures		2,107.62
Balance		$4,278.11
Lake Fund		
Income		$1,458.55
Expenditures		2,006.59
Balance	(overdraft)	135.58
Hatch Fund		
Balance		$ 500.00

Respectfully submitted,
Charles H. Blake, *Chairman*

May 10, 1939.

Report of the House Committee

During the year ending March 31, 1939, the House Committee had at its disposal funds amounting to $2,155.23, made up as follows:

Balance from previous year	$ 115.23
Appropriation for 1938–1939	1,800.00
Received for use of rooms	240.00
Total	$2,155.23

The expenditures amounted to $2,400.16, the deficit being made up by special contributions. Of this amount the sum of $2,134.66 has been spent for the routine expenses, janitor, light, heat, telephone, power, etc. and $265.50 has been spent for upkeep and equipment.

Meetings have been held as follows:

The Academy	8
American Association of University Women, Boston Branch	1
American Chemical Society, Northeastern Section	6
Boston Surgical Society	3
Bureau of University Travel	1
Friends of China, Inc.	3
Geological Society of Boston	2
Japan Society of Boston	3
Mediaeval Academy of America	1
Mount Holyoke Club of Boston	1
Near East College Association	1
New England Botanical Club	9
Women's Travel Club	2
	41

A detailed list of expenditures follows:

Janitor	$ 970.00
Electricity: Light	184.34
Power	51.22
Fuel	604.58
Elevator	72.60
Gas	49.40
Telephone	103.17
Water	69.92
Ash tickets	9.90
Upkeep	260.02
Furnishing and equipment	5.50
Janitor's supplies and sundries	19.51
Total	$2,400.16

Respectfully submitted,
J. C. Hunsaker, *Chairman*

May 10, 1939.

On the recommendation of the Rumford Committee, the Academy voted to award the Rumford Premium to Professor George Russell Harrison, of the Massachusetts Institute of Technology, in recognition of his notable work in spectrum photometry and spectrum analysis.

On the recommendation of the Treasurer, the Academy voted that the annual assessment for resident Fellows for the ensuing year be ten dollars.

The annual election resulted in the choice of the following officers and committees:

Harlow Shapley, *President*

James Flack Norris, *Vice-President for Class I*

Walter Bradford Cannon, *Vice-President for Class II*

George Grafton Wilson, *Vice-President for Class III*

ARTHUR STANLEY PEASE, *Vice-President for Class IV*
LEIGH HOADLEY, *Corresponding Secretary*
HUDSON HOAGLAND, *Recording Secretary*
HORACE SAYFORD FORD, *Treasurer*
HERVEY WOODBURN SHIMER, *Librarian*
CHARLES HENRY BLAKE, *Editor*

Councillors for Four Years:

EDWARD L. MORELAND, of Class I
IVAN M. JOHNSTON, of Class II
HOWARD L. BEVIS, of Class III
S. FOSTER DAMON, of Class IV

Finance Committee:

THOMAS BARBOUR — PAUL J. SACHS
RALPH E. FREEMAN — ALFRED L. RIPLEY

Rumford Committee:

NORTON A. KENT, *Chairman* — CHARLES L. NORTON
HARLOW SHAPLEY
PERCY W. BRIDGMAN — GEORGE W. PIERCE
HARRY M. GOODWIN — GEORGE R. HARRISON

C. M. Warren Committee:

JAMES F. NORRIS, *Chairman* — TENNEY L. DAVIS
FREDERICK G. KEYES
GREGORY P. BAXTER — REID HUNT
WALTER L. JENNINGS — CHARLES A. KRAUS

Committee of Publication:

CHARLES H. BLAKE, *Chairman*
EDWIN C. KEMBLE, of Class I
RALPH H. WETMORE, of Class II
JOSEPH H. BEALE, of Class III
ROBERT P. BLAKE, of Class IV

Committee on the Library:

HERVEY W. SHIMER, *Chairman*
RAYMOND C. ARCHIBALD, of Class I
THOMAS BARBOUR, of Class II
NATHAN ISAACS, of Class III
HENRY B. WASHBURN, of Class IV

Auditing Committee:

GEORGE R. AGASSIZ — ALEXANDER FORBES

House Committee:

ABBOTT P. USHER, *Chairman*
WILLIAM H. LAWRENCE
ROBERT P. BIGELOW
WALTER E. CLARK

Committee on Biographical Notices:

Three Years:

JOSEPH H. BEALE — ALFRED C. LANE

Committee on Policy and Resources:

For Five Years: GEORGE R. AGASSIZ
For Four Years: ROBERT G. DODGE
For Three Years: HENRY S. DENNISON
For Two Years: DUGALD C. JACKSON, *Chairman*
For One Year: TENNEY L. DAVIS

Committee on Meetings:

THE PRESIDENT

THE RECORDING SECRETARY

DUGALD C. JACKSON — ABBOTT P. USHER
TENNEY L. DAVIS — SAMUEL H. CROSS

The Corresponding Secretary announced that the following had been elected members of the Academy:

FELLOWS

CLASS I

Section 1. Bart Jan Bok, Lexington
Section 2. Lyman James Briggs, Washington, D. C.
Harry Edward Farnsworth, Providence, R. I.
Section 3. Clifford Burrough Purves, Cambridge
Frank Clifford Whitmore, State College, Pa.
Section 4. C. Richard Soderberg, Weston

CLASS II

Section 3. Gregory Pincus, Worcester
Arturo Rosenblueth, Watertown
Section 4. Frederick Fuller Russell, Brookline
William Thomas Salter, Milton

CLASS III

Section 1. Eugene Allen Gilmore, Iowa City, Ia.
Herbert Funk Goodrich, Philadelphia, Pa.

Section 1. John Loomer Hall, Boston
Augustus Noble Hand, New York, N. Y.
Albert James Harno, Urbana, Ill.
Robert Porter Patterson, New York, N. Y.
Thomas Walter Swan, New York, N. Y.

Section 3. Gottfried Haberler, Cambridge
Alvin Harvey Hansen, Belmont

Section 4. Chester Irving Barnard, Newark, N. J.
Ralph Edward Flanders, Springfield, Vt.
Henry Ingraham Harriman, Newton
Morris Evans Leeds, Philadelphia, Pa.
Owen D. Young, New York, N. Y.

CLASS IV

Section 2. Clarence Crane Brinton, Cambridge
Lawrence Bradford Packard, Amherst
Henry Rouse Viets, Dedham

Section 3. Henry Carrington Lancaster, Baltimore, Md.
John Matthews Manly, Chicago, Ill.
John Strong Perry Tatlock, Berkeley, Cal.
William Hoyt Worrell, Ann Arbor, Mich.

Section 4. Francis Henry Taylor, Worcester
Karl Ephraim Weston, Williamstown

FOREIGN HONORARY MEMBERS

CLASS I

Section 1. Arnaud Denjoy, Paris

CLASS II

Section 4. Sir Aldo Castellani, London and Rome

CLASS III

Section 1. Rt. Hon. Lord Atkin, London
Rt. Hon. Sir Wilfrid Arthur Greene, London
Sir William Searle Holdsworth, Oxford

Section 3. Henry Clay, Kenley, Surrey

Section 4. B. Seebohm Rowntree, North Dean, Bucks

The Academy was then addressed by Professor August Krogh, Head of the Department of Animal Physiology at the University of Copenhagen, and a Foreign Honorary Member of the Academy.

The following papers were read by title: "Serphidae in Baltic Amber, with the Description of a New Living Genus," by C. T. Brues: "Fossil Parasitic Hymenoptera of the Family Calliceratidae in Baltic Amber," by C. T. Brues.

The meeting was dissolved at 9.30 P. M.

One Thousand Two Hundred and Fifty Sixth Meeting

OCTOBER 11, 1939—STATED MEETING

The Academy met at its House at 8.16 P. M.

The President in the Chair.

There were present fifty-seven Fellows and fifteen guests.

The records of the meeting of May 10 were read and approved.

The Corresponding Secretary reported the receipt of letters accepting Fellowship from Chester Irving Barnard, Bart Jan Bok, Lyman James Briggs, Crane Brinton, Harry Edward Farnsworth, Ralph Edward Flanders, Herbert Funk Goodrich, Gottfried Haberler, John Loomer Hall, Augustus Noble Hand, Albert James Harno, Henry Ingraham Harriman, Henry Carrington Lancaster, Morris Evans Leeds, Robert Porter Patterson, Gregory Pincus, Clifford Burrough Purves, Arturo Rosenblueth, Frederick Fuller Russell, William Thomas Salter, C. Richard Soderberg, Thomas Walter Swan, John Strong Perry Tatlock, Francis Henry Taylor, Henry Rouse Viets, Karl Ephraim Weston, Frank Clifford Whitmore, William Hoyt Worrell, and Owen D. Young; and of letters accepting Foreign Honorary Membership from the Rt. Hon. Lord Atkin, Sir Aldo Castellani, Henry Clay, Arnaud Denjoy, the Rt. Hon. Sir Wilfrid Arthur Greene, B. Seebohm Rowntree, and John C. H. Wu, who was elected in 1938.

He then read an excerpt from the will of the late Arthur E. Kennelly as follows:

"*First:* I give and bequeath to the President and Fellows of Harvard College such books out of my scientific library, containing now about four thousand volumes, each volume having my book plate inserted in it, as the Librarian of Harvard College may select; to the Massachusetts Institute of Technology from the balance remain-

ing after the selection so made by said Librarian of Harvard College such books as may be selected by the Librarian of the Massachusetts Institute of Technology; to the American Academy of Arts and Sciences, from the balance remaining after the selection made on behalf of Harvard College and the Massachusetts Institute of Technology, such books as may be selected by the Librarian of the American Academy of Arts and Sciences."

He also reported the additional bequest to the Academy of a trust fund of $1,000.

The Corresponding Secretary reported that the Council had voted the following grants from the Permanent Science Fund:

1. To Professor Orlin Biddulph, of the Department of Botany, State College of Washington, toward the cost of further studies with radioactive phosphorus in plants, $200.

2. To Professor Hyman Y. Chase, Department of Zoology, Howard University, toward the cost of further studies on the effect of ultraviolet upon cell division in marine eggs, $300.

3. To Mr. William G. Clark, Instructor, Department of Zoology, University of Minnesota, for assistance, animals and expendable materials in his investigation of the relations between adrenal cortex and membrane functions, $400.

4. To Dr. Rudolf Hoeber, Visiting Professor of Physiology, University of Pennsylvania Medical School, for compensation of an assistant in a study of the relation between molecular configuration of dyestuffs and their secretion by the kidney, $600.

5. To Mr. Lewis H. Kleinholz, Instructor in Biology, Cambridge School of Liberal Arts, for purchase of test animals in a determination of the distribution of the pituitary hormone, intermedin, $75.

6. To Professor Robert H. Lowie, Department of Anthropology, University of California, toward the expense of an investigation by Snr. Curt Nimuendaju of the Kayapo Indians and their cogeners in the region west of the Araguaya River, Brazil, $500.

7. To Mr. William G. Lynn, Associate in Zoology, The Johns Hopkins University, for the cost of illustrations of a monograph on amphibians of Jamaica, B. W. I., which has been accepted for publication, $170.

8. To Professor Thomas L. Patterson, Department of Physiology, Wayne University College of Medicine, for purchase of animals for his study of the effect of changed emotional states on body activity, $60.

9. To Professor William B. Redmond, Department of Biology, Emory University, for the purchase of animals required in a further study of a new method of immunization against malaria, $350.

10. To Mr. Edward J. Schremp, Instructor in Physics, Washington University, toward the cost of materials and equipment to be used in the determination of directional distribution of cosmic rays at St. Louis, $500.

11. To Professor C. Richard Soderberg, Massachusetts Institute of Technology, toward the cost of his investigation of the plastic properties of polycrystalline metals, the award to be contingent upon the securing by the applicant of sufficient funds to assure the continuation of this project for at least one year, $500.

12. To Mr. David M. Steven, Henry Fellow, Harvard University, toward the cost of his investigation of night blindness as an index of vitamin A deficiency, among the population of Labrador and North Newfoundland, $400.

13. To Mr. Martin D. Whitaker, Instructor in Physics, New York University, for one year's rental of a radium-beryllium source of neutrons for his studies on differential effects in slow neutron scattering, $850.

The President announced the death of eight Fellows: Harvey Cushing (Class II, Section 4), Charles Hall Grandgent (Class IV, Section 3), Joseph Grinnell (Class II, Section 3), Arthur Edwin Kennelly (Class I, Section 4), Charles Ladd Norton (Class I, Section 2), Philip Stanley Parker (Class III, Section 1), William James Mayo (Class II, Section 4), and Arthur Edward Wells (Class I, Section 4).

The President spoke briefly in regard to the policy of the Academy.

Professor Norton A. Kent, Chairman of the Rumford Committee, then presented the Rumford medals to Professor George Russell Harrison in recognition of his notable work in spectrum photometry and spectrum analysis.

The following communication was presented:

Mr. George R. Harrison: "New Methods in Spectroscopy."

One paper was read by title: "The Measure-

ment of Hydrostatic Pressure to 30,000 kg/cm^2," by P. W. Bridgman.

The meeting was dissolved at 9.32 P. M.

One Thousand Two Hundred and Fifty Seventh Meeting

NOVEMBER 8, 1939—STATED MEETING

The Academy met at its House at 8.28 P. M.

The President in the Chair.

This meeting having been designated as Ladies' Night, there were present about 275 Fellows and guests.

The records of the meeting of October 11 were read and approved.

The Corresponding Secretary reported the receipt of a letter from Sir William Searle Holdsworth accepting his election as a Foreign Honorary Member.

A letter from Dr. Karl T. Compton, Chairman of the Committee on Awards of the National Association of Manufacturers, was read in part as follows:

"The National Association of Manufacturers has developed a Modern Pioneer Program which will commemorate the 150th anniversary of the founding of the American patent system and honor deserving inventors and research workers."

"Manufacturers throughout the nation have been invited to nominate inventors and research workers for awards. As Chairman of the Committee on Awards which will select those who are to be honored, I am inviting you and your society to submit nominees."

The Fellows were told to apply to Dr. Compton for recommendation blanks.

The President called attention to the afternoon symposium on the Internal Structure of the Earth which will be held on the day of the December meeting of the Academy at its House, to be followed by the regular evening meeting of the Academy, with a communication by Professor Reginald A. Daly.

The President then described the exhibits on view this evening after the communication, consisting of letters to the Academy from the seven Presidents of the United States who have been Fellows, beginning with George Washington; and a selection of portable sundials from the Harold C. Ernst collection now permanently on display at the Harvard College Observatory.

The following communication was presented:

Dr. George H. Edgell: "Selected Masterpieces in the Boston Museum of Fine Arts," illustrated with lantern slides.

The meeting was dissolved at 9.35 P. M.

One Thousand Two Hundred and Fifty Eighth Meeting

DECEMBER 13, 1939—STATED MEETING

The Academy met at its House at 8.15 P. M.

The President in the Chair.

There were present forty-nine Fellows and twenty guests.

The records of the meeting of November 8 were read and approved.

The Corresponding Secretary reported the receipt of letters declining election as Fellows from Eugene Allen Gilmore, John Matthews Manly, and Lawrence Bradford Packard; also a letter from Charles Collens resigning Fellowship.

The President announced the death of five Fellows: Henry Clinton Fall (Class II, Section 3), Frank Johnson Goodnow (Class III, Section 4), Waldemar Lindgren (Class II, Section 1), Floyd Karker Richtmyer (Class I, Section 2), and Frederick Adams Woods (Class II, Section 3).

The President described the exhibits to be seen in the Reading Rooms after the meeting, consisting of some unusual meteorites, seismograms illustrating earthquakes, quarry blasts, and other types of earth disturbances, and a few letters from Foreign Honorary Members of the Academy.

He outlined the Latin American program for the January meeting and spoke of its appropriateness for broadcasting. He also announced that the speaker at the April meeting would be Dr. Hu Shih, Chinese Ambassador to the United States.

The President then gave a summary of the symposium on the Internal Structure of the Earth, which had been held at the Academy in the afternoon.

The following communication was presented:

Dr. Reginald H. Daly: "New Light on the Earth's Interior: The Physical Basis of Mountain Making. Volcanic Action, and Changes of Level," with lantern illustrations.

Dr. Philip Hofer, of the Harvard College Library, then described three rare books belonging to that library, which were to be displayed after the meeting. These were as follows:

1. The Bible, in Greek, Latin, Hebrew and Chaldaean. (Also called "The Complutensian Polyglot Bible.") Alcalá de Henares (Spain) 1517–22.

2. A Collection of Elizabethan (English) Proclamations formed by Humphrey Dyson. (London), c. 1618.

3. Pushkin—"Volga" (a Fairy Tale). St. Petersburg, 1904. Presentation copy to the Tsarevitch Alexis.

The meeting was dissolved at 10.07 P. M.

One Thousand Two Hundred and Fifty Ninth Meeting

JANUARY 10, 1940—STATED MEETING

The Academy met at its House at 8.20 P. M.

The President in the Chair.

There were present fifty-three Fellows and five guests.

The records of the meeting of December 13 were read and approved.

The Corresponding Secretary reported the receipt of a letter from the Department of State announcing that the Pan-American Union will hold its 8th Scientific Congress in Washington on May 10–18, 1940.

The President announced the death of Charles Barrois, Foreign Honorary Member in Class II, Section 1, and of James Pyle Wickersham Crawford, Fellow in Class IV, Section 3.

He also mentioned that Dr. C. C. Little would speak on cancer research at the May meeting, and that the March program would probably be a social science symposium.

The President discussed the problems of the Academy library, which is not much used, despite its value as a reference library, comparing its problems to those of the American Philosophical Society library.

The following communications were presented:

Clarence H. Haring: "Liberty and Despotism in South America."

Jeremiah D. M. Ford: "Hispano-American Culture."

Dr. Frank M. Carpenter then described the collection of fossil insects on exhibition in the Reading Room.

The following paper was read by title: "Neurohumors as Chromatophore Activators," by G. H. Parker.

The meeting was dissolved at 9.53 P. M.

One Thousand Two Hundred and Sixtieth Meeting

FEBRUARY 14, 1940—STATED MEETING

Owing to a blizzard, the meeting was not attended by the required quorum of twenty-five Fellows. Since there were present seventeen Fellows and eight guests who had braved the weather, the President formally adjourned the meeting, but said that the scheduled communication would be presented.

Dr. Gregory Pincus then read a paper entitled: "Artificial Parthenogenesis and Sexual Reproduction in Animals," illustrated with lantern slides.

One Thousand Two Hundred and Sixty First Meeting

MARCH 13, 1940—STATED MEETING

The Academy met at its House at 8.20 P. M.

The President in the Chair.

There were present thirty-one Fellows and five guests.

In the absence of the Recording Secretary, Professor Tenney L. Davis was asked to assume his duties.

The records of the meetings of January 10 and February 14 were read and approved.

It was reported that letters resigning Fellowship had been received from Charles Palache and Frederick S. Woods, and one declining Fellowship from Alvin H. Hansen; that Professor George G. Wilson had resigned as Vice-President of Class III, and that the Council had appointed Professor Edmund M. Morgan to fill out his term.

It was announced that the Council had made the following grants from the Permanent Science Fund:

1. To Professor Kenneth D. Roeder, Department of Biology, Tufts College, toward the cost of an investigation in electro-physiology of sensory mechanisms in Arthropoda, $400.

2. To Professor Charles J. Lyon, Department of Botany, Dartmouth College, for the preparation of a tree-ring calendar in New England, $200.

3. To Dr. F. B. Mallory and Dr. F. Parker, Jr., Boston City Hospital, for continuing a study of chronic lead poisoning and liver pathologies, $510.

4. To Professor Neal A. Weber, Department of Biology, University of North Dakota, toward the cost of ecological studies of the ant fauna of Ethiopian and Neotropical regions, $200.

5. To Professor Alice H. Farnsworth, Department of Astronomy, Mount Holyoke College, toward the expenses, including transportation of equipment, for spectroscopic studies in astronomy in the southern hemisphere, $400.

6. To Professor Frank R. Kille, Department of Zoology, Swarthmore College, for histological studies of a seasonal cycle of the gonad in Thyone briareus, $300.

7. To Professor Alexis L. Romanoff, Department of Poultry Husbandry, Cornell University, for studies on embryo respiration, to be conducted at Harvard University, $150.

8. To Betty Holmes Huscher, Assistant Curator of Archaeology, and Harold A. Huscher, Field Assistant, of the Colorado Museum of Natural History, for archeological studies in western Colorado, $500.

9. To Professor Ernest E. Tyzzer, Harvard Medical School, to continue a study on dermatitis of human skin caused by non-human schistosome cercariae in Boston, $400.

The President announced the death of three Fellows: Herbert Vincent Neal (Class II, Section 3), Arthur Edwin Norton (Class I, Section 4) and Franklin Bache Stephenson (Class IV, Section 3).

He also appointed the Nominating Committee as follows:

Edwin B. Wilson, of Class I
Leigh Hoadley, of Class II, *Chairman*
Henry S. Dennison, of Class III
Robert H. Pfeiffer, of Class IV

The following appropriations were voted for the fiscal year ending March 31, 1941:

From the income of the General Fund, $7,200, to be used as follows:

General and Meeting expenses	$ 900
Library expenses	2,100
Books, Periodicals, and Binding	1,200
House expenses	2,000
Treasurer's expenses	900
President's expenses	100
	$7,200

From the income of the Publication Funds, $2,123.70, to be used for publication.

From the income of the Rumford Fund, $3,500, to be used at the discretion of the Committee.

From the income of the C. M. Warren Fund, $873.32, to be used at the discretion of the Committee.

It was *Voted*, to offer for consideration at the next meeting of the Academy, the following proposed amendments to the Statutes, recommended by the Treasurer and approved by the Council:

Chapter VII, Article 1, par. 1, to read: "The Treasurer shall collect all money due or payable to the Academy and all gifts or bequests made to it. He shall pay all bills due and payable by the Academy when approved by the proper officers. He shall sign all leases of real estate, in the name of the Academy. He shall be the official custodian of all bonds, stocks and other securities and, with the written approval of any one member of the Committee on Finance, he shall have full authority to sell and transfer, invest and reinvest from time to time in such manner and upon such terms as shall to him seem best, the whole or any part of the personal property of the said Academy."

Chapter XI, Article 2, par. (1), to read: "Committee on Finance, to consist of four Fellows who shall have general oversight of the funds and investments of the Academy."

The following communication was then presented:

A. E. Staley: "World Economy in Transition."

Professor Tenney L. Davis then described the historical seal of the Academy, illustrated with a lantern slide.

Dr. Donald H. Menzel explained briefly the technique of the production of "invisible" glass, some examples of which glass were on exhibition in the Library office.

Two papers were read by title: "A Revision of the Nearctic Hemerobiidae, Sisyridae, Berothidae, Polystoechotidae, and Dilaridae," by F. M. Carpenter; "Fossil Parasitic Hymenoptera of the Family Scelionidae from Baltic Amber," by C. T. Brues.

The meeting was dissolved at 10.30 P. M.

One Thousand Two Hundred and Sixty Second Meeting

APRIL 10, 1940—STATED MEETING

The Academy met at its House at 8.22 P. M.

The President in the Chair.

There were present about 200 Fellows and guests, this having been designated as Ladies' Night.

The reading of the records of the meeting of March 13 was postponed until the May meeting.

The Corresponding Secretary read a letter from the Secretary of State containing invitations to the sessions of the Pan-American Scientific Congress to be held in Washington, D. C.

The following communication was presented:

His Excellency, Dr. Hu Shih: "Some Philosophical Rebels of Seventeenth Century China."

Dr. Edward Wigglesworth then described the exhibit of synthetic gems on display in the Library office, with the methods in use for identifying them by means of "Diamondscopes."

The meeting was dissolved at 9.30 P. M.

One Thousand Two Hundred and Sixty Third Meeting

MAY 8, 1940—ANNUAL MEETING

The Academy met at its House at 8.20 P. M.

The President in the Chair.

There were present fifty-one Fellows and nine guests.

The records of the meetings of March 13 and April 10 were read and approved.

The Corresponding Secretary announced the appointment by the Council of these two committees for the ensuing year:

Amory Fund Committee: Roger I. Lee, *Chairman;* Walter B. Cannon, David Cheever, Leigh Hoadley, William C. Quinby, Edward E. Tyzzer, Soma Weiss.

Permanent Science Fund Committee: John W. M. Bunker, *Chairman;* George R. Agassiz, Kenneth T. Bainbridge, Gregory P. Baxter, Charles T. Brues, Hudson Hoagland, Walter S. Hunter, S. Burt Wolbach.

The following communication was presented:

Clarence Cook Little: "Cancer Research and the National Health Problem."

The communication was discussed at some length by a number of Fellows.

The President announced the deaths of four Foreign Honorary Members: Waldemar Christofer Brøgger (Class II, Section 1), Wilhelm Dörpfeld (Class IV, Section 2), Herbert Albert Laurens Fisher (Class IV, Section 2), and Henri Pirenne (Class IV, Section 2).

A vote of thanks was passed to WRUL for broadcasting some of the Academy meetings during the year.

The President announced a gift of $2,000 from Mrs. George R. Agassiz, the income of which is to be used to provide refreshments at the "open house" meetings of the Academy.

He also announced a gift of $2,500 from an anonymous donor, this sum to be used for an investigation of the functions of the Academy under the direction of the Committee on Policy and Resources.

Also an additional gift of $85,000 to the Permanent Science Fund held in trust by the Boston Safe Deposit and Trust Company, the annual income from which is paid to the Academy to be used "for such scientific purposes as it shall from time to time select."

The following report of the Council was presented:

REPORT OF THE COUNCIL

Since the last report of the Council there have been reported the deaths of seventeen Fellows: James Pyle Wickersham Crawford, Harvey Cushing, Henry Clinton Fall, Frank Johnson Goodnow, Charles Hall Grandgent, Joseph Grinnell, Arthur Edwin Kennelly, Waldemar Lindgren, William James Mayo, Herbert Vincent Neal, Arthur Edwin Norton, Charles Ladd Norton, Philip Stanley Parker, Floyd Karker Richtmyer, Franklin Bache Stephenson, Arthur Edwin Wells, Frederick Adams Woods; and five Foreign Honorary Members: Charles Barrois, Waldemar Christofer Brøgger, Wilhelm Dörpfeld, Herbert Albert Laurens Fisher, Henri Pirenne.

Thirty-three Fellows and seven Foreign Honorary Members were elected by the Council and announced to the Academy in May 1939.

The roll now includes 776 Fellows and 125 Foreign Honorary Members (not including those elected in May 1940).

The annual report of the Treasurer was read, of which the following is an abstract:

TREASURER'S REPORT

OPERATING RECEIPTS

Income from Investments (Schedules D and G)	$12,435.53
Income from Trustees Permanent Science Fund	8,583.00
Assessments and Admissions	4,175.00
Estate of Arthur E. Kennelly, Bequest	1,024.17
Sale of Publications	216.33
Contributions to Publication Account	10.00
Lake Publication Fund Subscriptions	678.67
Appropriation, Current Expense Fund	55.83
Total	$27,178.53

OPERATING EXPENDITURES

Academy, General:		
Library, Salaries	$2,060.00	
Books and Binding	993.39	
		$ 3,053.39
General Expenses (Net)		1,126.00
House Expenses (Net)		2,130.27
President's Office		111.61
Treasurer's Office		870.96
Total		$ 7,292.23
Amory Fund:		
Publication		75.00
Publication Committee:		
General Publications	$1,449.06	
Lake Publications	749.33	
		2,198.39
Rumford Fund:		
Grants	$2,940.00	
Medals (Net)	325.10	
Miscellaneous	24.00	
		3,289.10
Warren Fund:		
Grants		1,280.00
Permanent Science Fund:		
Grants	$8,305.00	
Expenses	63.70	
		8,368.70
Total (Schedule F)		$22,503.42
(a) *Income Transferred to Principal*		
Appleton Fund	$ 50.67	
Centennial Fund	84.63	
Rumford Fund	151.50	
Warren Fund	48.75	
		335.55
Total		$22,838.97
Excess Receipts		4,339.56
Total		$27,178.53

(a) 5 per cent of estimated income for 1939–40.

DESCRIPTION OF FUNDS

General Funds

Present Balances: $50,087.09 General Fund; $2,400.00 Life Membership Fund; $3,730.91 Current Expense Fund.

Established by various subscriptions and contributions. The income of the first two funds is available for the general purposes and maintenance of the Academy—and both principal and income of the Current Expense Fund are available if needed.

Francis Amory Fund

Bequest, 1912. Present balance, $53,470.38. For the purpose of establishing a Septennial Prize and a gold medal to encourage the invention and discovery of measures for the relief of maladies peculiar to the bladder and the various organs connected with it. The bequest directed that public notice should be given of the nature and design of the Fund and contributions should be solicited in aid of it—also, that no award of the income be made until twenty-one years after the date of Mr. Amory's death (*i. e.* 1933).

Appleton Fund

Present balance, $17,458.39. Established in 1854. The Trustees under the will of Samuel Appleton turned over to the Academy, certain manufacturing stocks, of the par value of $10,000, for the purpose of constituting "a fund, the income of which is to be applied to the publication of the transaction of the said Society."

Centennial Publication Fund

Present balance, $25,678.40. Established in 1880 by gift of $1,000 from Dr. B. E. Cotting, a Fellow. Balance from subscriptions solicited by the Centennial Committee. Income is applied to publishing the transactions of the Academy.

Arthur E. Kennelly Fund

Bequest, 1939, $1,024.17. Unrestricted as to principal and income.

Permanent Science Fund

Present balance, approximately $200,000.* Fund established in September, 1928, by agreement and declaration of trust of the Boston Safe Deposit and Trust Company, acting as Trustee. Principal of Fund is held and invested by the Trustee and the annual income (approximately $6,000) used for grants for scientific research on recommendation of the Committee on the Permanent Science Fund of the Academy.

Rumford Fund

Gift of Count Rumford, 1797, $5,000 in three per cent stock of the United States. Present

* Increased in April, 1940, by receipt of $85,000.

principal $94,968.73. Income to be applied every second year as a premium "to the author of the most important discovery or useful improvement which shall be made or published in writing during the preceding two years on heat and light."

In 1832, the Supreme Judicial Court of Massachusetts decreed that the balance of income might be used for the purchase of books, papers, philosophical apparatus, making publications or procuring lecturers, experiments and investigations, thereby carrying out the general intent and purposes of Count Rumford. And, because the investment of the Fund could no longer be carried in stock of the United States, investment was permitted in "either notes or debts of the United States, or of the Commonwealth of Massachusetts or of the City of Boston, or in the stock of any bank in this Commonwealth or in notes or bonds secured by pledge of any of said stock or by mortgage of real estate in this Commonwealth or may be deposited in trust, and on interest, with the Massachusetts Hospital Life Insurance Company." This limitation is still in effect.

This decree also empowered the Academy to award the Rumford premium at any annual meeting, instead of biennially.

C. M. Warren Fund

Bequest of Cyrus M. Warren, 1891. Present balance, $16,824.64. The principal is to be held at interest and the income is to be applied toward the encouragement and advancement of research and of science in the field of Chemistry.

The following reports were also presented:

Report of the Library Committee

During the year 110 volumes and eight unbound numbers of serials were borrowed by thirteen Fellows and twenty libraries, and many more have been consulted at the Academy.

The number of volumes on the shelves at the time of the last report was 46,039. During the year 302 volumes were added, making the number now 46,341. Of this number 260 were received by gift or exchange, and 42 were purchased.

The appropriation for the year ending March 31, 1940, was $3,300, and the expenditures were as follows:

Salaries	$2,060.00
Purchase of Books and Periodicals	446.94
Binding	546.45
	$3,053.39

The European war has naturally interfered to a certain extent with the receipt of serial publications from the foreign institutions with which the Academy has exchange relations, and this accounts partly for the fewer volumes added this year. It is also due in part to the fact that a number of volumes which were at the binder's were returned too late to be included in this year's report. Volumes of journals and other serials are not counted by us as "volumes added to the library" until they have been bound and placed on the library shelves.

Respectfully submitted,

H. W. Shimer, *Librarian*

May 8, 1940.

Report of the Rumford Committee

A meeting of the Rumford Committee was held October 2, 1939. At that meeting, the following grants were made:

October 2, '39		
No. 348	To Professor R. W. Wood for the construction of various prisms and optical flats.	$300
No. 349	To Professor Newell S. Gingrich for the purchase of an X-ray spectrometer for use in the study of the diffration of X-rays by fluids.	375
No. 350	To Dr. E. J. Schremp for apparatus to be used in the study of the fine structure of cosmic rays, conditioned on his being able to use this sum instead of the $500 for which he asked.	400
No. 351	To Dr. H. M. O'Bryan for assistance in the study of the absorption of films of alkali metals in the far ultra-violet and the absorption of crystals above 1100 A.	400

Grants made by correspondence between October 16, '39 and March 22, '40 were as follows:

October 16, '39		
No. 352	To Professor George R. Harrison for the purchase of pure metals in connection with his spectrum work.	$400

January 16, '40		
No. 353	To Professor P. W. Bridgman in support of measurements of various thermo-dynamic properties of matter at high pressure.	$400
January 23, '40		
No. 354	To Dr. Wilson M. Powell in support of his search for narrow showers, consisting of mesotrons, in cosmic ray phenomena.	165
March 22, '40		
No. 355	To Dr. Chauncey Starr to aid in his research on the magnetic properties of various compounds and alloys.	400

Letters were sent to fifteen recipients of grants made between December 11, 1935 and January 19, 1939. Replies were received from all grantees and considerable progress was reported.

On October 11, 1939, the Rumford Medals were presented to Professor George Russell Harrison for his "Improvements in Spectroscopic Technique." Following the award of these medals, Dr. Harrison addressed the Academy on "New Methods in Spectroscopy," the first part of his address being put "on the air" by station WRUL. The latter part, being more technical, was delivered to the Academy alone. As a matter of record it may be stated that this was the first time that a meeting of the Academy was broadcast.

Respectfully submitted,

NORTON ADAMS KENT, *Chairman*

May 8, 1940.

REPORT OF THE C. M. WARREN COMMITTEE

The Committee had at its disposal during the fiscal year 1939–1940, $1,280.

Grants were made to aid scientific investigation totalling this sum.

Since the last annual report, grants have been made as follows:

Dr. I. Amdur, Massachusetts Institute of Technology, $500, to be used for apparatus necessary in his experimental determination of the potential fields between atoms and molecules.

Professor Robert C. Elderfield, Columbia University, $200, to be used in the study of toxic substances in loco weed.

Professor J. W. McBain, Stanford University, $180, for the purchase of additional X-ray apparatus to be used in the investigation of the crystal structure of the various constituents of soap colloids.

Professor Gerhard Dietrichson, Massachusetts Institute of Technology, $300, for the purchase of apparatus needed in his determination of gas densities.

Professor J. Leslie Jones, Howard University, $300, to be used in the study of kinetics of gas reactions. Money to be used for apparatus.

Reports of progress have been received from: Messrs. Dietrichson, Heidt, Huntress, Johnson, Jones, McBain, and Schmidt.

During the year, the papers listed below, which have not been previously reported, describe investigations aided by the Warren Fund.

Lawrence J. Heidt. Quantum Yields and Kinetics of a Photo-sensitized Production of Reducing Sugars from Sucrose in Aqueous Solutions of Uranyl Sulfate by Visible and Ultraviolet Light. J. Am. Chem. Soc., *61*, 3223 (1939).

Ernest H. Huntress and Frederick H. Carten. I. Chlorosulfonic Acid as a Reagent for the Identification of Aryl Halides. J. Am. Chem. Soc., *62*, 511–514 (1940).

Margaret K. Seikel. II. Piperidyl Derivatives of Aromatic Halogenonitro Compounds. J. Am. Chem. Soc., *62*, 750–756 (1940).

Ernest H. Huntress and Frederick H. Carten. III. Chlorosulfonic Acid as a Reagent for the Characterization of Aromatic Ether. J. Am. Chem. Soc., *62*, 603–604 (1940).

J. Leslie Jones. Kinetic Studies on Iodine Derivatives. II. The Thermal Decomposition of Iodomethyl Ether. (Contribution from the Chemical Laboratory of Howard University. The final report of the present investigation will be published in one of the journals with grateful acknowledgment to the Cyrus M. Warren Fund.)

A. C. Batchelder and Carl L. A. Schmidt. The Effects of Certain Salt Mixtures on the Dissociation of Glycine and Alanine. The Journal of Physical Chemistry, *Vol. 43*, No. 9, December, 1939.

JAMES F. NORRIS, *Chairman*

May 8, 1940.

Report of the Committee of Publication

During the year 1939–1940, there have been published one number of the Memoirs and eight numbers of the Proceedings. Another Fascicle of the Monumenta Palaeographica Vetera has appeared.

It is again a pleasure to the Editor to record his appreciation of the helpfulness of the committee and the various authors. Special mention should be made of the assistance of Prof. J. R. Ware, which made possible the use of Chinese type in the articles by Davis and Chao.

Since the Treasurer's report this year will be more detailed than has been customary in the past, it does not seem necessary to repeat here the information which will be in that report. It is only proper to remark that a considerable part of the balance in the general fund is earmarked for papers just issued or going through the press.

If the retiring chairman may be permitted two comments on policy, he will suggest that part time clerical assistance would greatly facilitate the work of his office and that the series of Memoirs should be abandoned except for the continuation of one or two monographs which are still incomplete.

Respectfully submitted,

Charles H. Blake, *Chairman*

May 8, 1940.

Report of the House Committee

During the year ending March 31, 1940, the House Committee has had at its disposal funds amounting to $2,256, made up as follows:

Appropriation for 1939–1940	$2,000
Received from other societies for use of rooms.	256
Total	$2,256

The expenditures amounted to $2,386.27. Of this the sum of $2,121.38 was spent for the routine expenses, janitor, heat, light, telephone, etc. and $264.89 for upkeep, furnishings and equipment. The most important items in this latter category were $80.88 for roof repairs and $83.40 for an exhibition case.

Owing to our limited appropriation and the necessity for using our funds for such emergencies as repairs to the roof and the plumbing, we have been obliged for some years to neglect the needed repainting of the interior of the building. We hope to do some parts this summer, though it will not be possible to do much with the funds at our disposal.

Meetings have been held as follows:

The Academy	8
Archaeological Institute of America, Boston Chapter	1
Boston Surgical Society	2
Friends of China, Inc.	1
Geological Society of Boston	1
Japan Society of Boston	3
Mediaeval Academy of America	1
Mount Holyoke Club of Boston	1
New England Botanical Club	8
Total	26

The Northeastern Section of the American Chemical Society, which has held monthly meetings at the Academy from October to May for several years, found that our Lecture Hall had become too small for its purpose and is now holding its meetings elsewhere.

The Council Chamber has been used for the Academy Council and Committee meetings, and also by the Trustees of the Children's Museum, the New England Farm and Garden Association, etc.

A detailed list of expenditures follows:

Janitor	$ 980.00
Electricity: Light	201.37
Power	58.76
Fuel	576.45
Elevator	69.60
Telephone	111.25
Gas	52.40
Water	40.48
Upkeep	152.99
Furnishing and equipment	111.90
Janitor's supplies and sundries	31.07
Total	$2,386.27

Respectfully submitted,

Abbott P. Usher, *Chairman*

May 8, 1940.

The Corresponding Secretary announced that the following had been elected members of the Academy:

FELLOWS

Class I

Section 2. Frederick Vinton Hunt, Belmont
J. Robert Oppenheimer, Berkeley, Cal.

Section 3. William Lloyd Evans, Columbus, Ohio

Section 4. Harold Locke Hazen, Belmont
John Wulff, Cambridge

Class II

Section 2. Albert Francis Blakeslee, Cold Spring Harbor, N. Y.
Paul Christoph Mangelsdorf, College Station, Texas

Section 4. William de Berniere MacNider, Chapel Hill, N. C.
Donald Dexter Van Slyke, New York, N. Y.
Paul Dudley White, Brookline

Class III

Section 1. Lon Louvois Fuller, Durham, N. C.
Lloyd Kirkham Garrison, Madison, Wis.
Henry Tilton Lummus, Swampscott

Section 2. Robert Granville Caldwell, Belmont
Thomas Head Thomas, Cambridge

Section 3. Lewis Cecil Gray, Washington, D. C.
Alvin Saunders Johnson, New York, N. Y.

Section 4. Henry Bruere, New York, N. Y.
Richard Spencer Childs, New York, N. Y.

Class IV

Section 2. Herbert Eugene Bolton, Berkeley, Cal.

Section 3. Serge Elisséeff, Cambridge
Werner Wilhelm Jaeger, Watertown
Edgar Howard Sturtevant, New Haven, Conn.

Section 4. Archibald MacLeish, Washington, D. C.

FOREIGN HONORARY MEMBERS

Class IV

Section 2. Martin Persson Nilsson, Lund

Section 4. Fernand Baldensperger, Paris
Paul Hindemith, New Haven, Conn.
Igor Strawinsky, Paris

On the recommendation of the Council, it was *Voted*, to amend Chapters VII and XI of the Statutes, as follows:

CHAPTER VII—*The Treasurer and the Treasury*

Article 1, par. 1, to read as follows:

The Treasurer shall collect all money due or payable to the Academy and all gifts or bequests made to it. He shall pay all bills due and payable by the Academy when approved by the proper officers. He shall sign all leases of real estate in the name of the Academy. He shall be the official custodian of all bonds, stocks and other securities and, with the written approval of any one member of the Committee on Finance, he shall have full authority to sell and transfer, invest and reinvest from time to time in such manner and upon such terms as shall to him seem best, the whole or any part of the personal property of the said Academy.

CHAPTER XI—*Standing Committees*

Article 2, to read as follows:

At the annual meeting, the following Standing Committees shall be elected by ballot to serve for the ensuing year:

(1) Committee on Finance, to consist of four Fellows who shall have general oversight of the funds and investments of the Academy.

On the recommendation of the Treasurer, it was *Voted*, that the annual assessment for resident Fellows for the ensuing year be ten dollars.

The annual election resulted in the choice of the following officers and committees:

HARLOW SHAPLEY, *President*
PERCY W. BRIDGMAN, *Vice-President for Class I*
S. BURT WOLBACH, *Vice-President for Class II*
SIDNEY B. FAY, *Vice-President for Class III*
ARTHUR S. PEASE, *Vice-President for Class IV*
ABBOTT P. USHER, *Corresponding Secretary*
HUDSON HOAGLAND, *Recording Secretary*
HORACE S. FORD, *Treasurer*
HERVEY W. SHIMER, *Librarian*
ROBERT P. BLAKE, *Editor*

Councillors for Four Years:

ARTHUR A. BLANCHARD, of Class I
WILLIAM B. CASTLE, of Class II
HENRY P. KENDALL, of Class III
CHARLES H. TAYLOR, of Class IV

Councillor for Three Years:

ARTHUR N. HOLCOMBE, of Class III

Councillor for Two Years:

AUSTIN W. SCOTT, of Class III

Committee on Policy and Resources:

Five Years: TENNEY L. DAVIS

Finance Committee:

THOMAS BARBOUR
RALPH E. FREEMAN
PAUL J. SACHS
ALFRED L. RIPLEY

Rumford Committee:

NORTON A. KENT, *Chairman*
PERCY W. BRIDGMAN
HARRY M. GOODWIN
HARLOW SHAPLEY
GEORGE W. PIERCE
GEORGE R. HARRISON
ROBERT B. LINDSAY

C. M. Warren Committee:

FREDERICK G. KEYES, *Chairman*
GREGORY P. BAXTER
WALTER L. JENNINGS
TENNEY L. DAVIS
REID HUNT
CHARLES A. KRAUS
GRINNELL JONES

Committee of Publication:

ROBERT P. BLAKE, *Chairman*
EDWIN C. KEMBLE, of Class I
RALPH H. WETMORE, of Class II
JOSEPH H. BEALE, of Class III
ROBERT P. CASEY, of Class IV

Committee on the Library:

HERVEY W. SHIMER, *Chairman*
RAYMOND C. ARCHIBALD, of Class I
THOMAS BARBOUR, of Class II
NATHAN ISAACS, of Class III
HENRY B. WASHBURN, of Class IV

Auditing Committee:

GEORGE R. AGASSIZ
ALEXANDER FORBES

House Committee:

ERNEST F. LANGLEY, *Chairman*
WILLIAM H. LAWRENCE
ROBERT P. BIGELOW
WALTER E. CLARK

Committee on Biographical Notices:

Three Years:

RAYMOND C. ARCHIBALD
SAMUEL E. MORISON

One Year:

J. SEELYE BIXLER, *Chairman*

Committee on Meetings:

THE PRESIDENT
THE RECORDING SECRETARY
DUGALD C. JACKSON
TENNEY L. DAVIS
ABBOTT P. USHER
SAMUEL H. CROSS

Insert on page 112.

Dr. Bart J. Bok explained the exhibit of astronomical photographs, mostly from South Africa, illustrating recent work on stars and galaxies.

One paper was read by title: "The Old World Species of the Celastraceous Genus *Microtropis* Wallich," by E. D. Merrill and F. L. Freeman.

The meeting was dissolved at 10.15 P. M.

BIOGRAPHICAL NOTICES

ERNEST WILLIAM BROWN (1866–1938)

Fellow in Class I, Section 1, 1912

The Academy is proud to have numbered among her fellows all three of the distinguished men who in this hemisphere long worked on the problem of the moon's motion. I refer to Simon Newcomb, admitted to the Academy in 1860, to George William Hill in 1873, and to Ernest William Brown in 1912. They all became presidents of the American Mathematical Society, and Hill and Brown were the greatest mathematical astronomers who ever achieved their careers in America. Two of them were born in the British Empire, Newcomb in Nova Scotia and Brown at Hull, England, on 29 November 1866.

Brown graduated from the University of Cambridge (A.B. 1887, A.M. 1891, Sc.D. 1897). During a year of postgraduate study there his chief advisor was Professor G. H. Darwin, who recommended him to study Hill's classic paper "Researches in the lunar theory." He thus became started on a field of research which was to engage his attention for more than 45 years.

In 1891 he came to America as an instructor in mathematics at Haverford College and continued there, with advanced academic title, until 1907, and constantly active in research. During this period there are in his bibliography forty-five titles, including *An Introductory Treatise on the Lunar Theory* (1896), and his Adams Prize Essay for 1907 on *The Inequalities in the Motion of the Moon due to the Direct Action of the Planets*. He was elected a fellow of the Royal Society (1898), was awarded the gold medal of the Royal Astronomical Society (1907) and served as joint editor of the *Transactions* of the American Mathematical Society from its foundation until 1906. In 1903 mathematicians of America ranked him as seventh among the first 80. Beginning with an extension of Hill's work Brown was gradually led to a complete development of a lunar theory that includes the gravitational action of every particle of matter which can have a sensible effect on the moon's motion. This work is summarized in the great *Memoirs* of the Royal Astronomical Society, 1897–1908.

Professor Brown was professor of mathematics at Yale University 1907–21; Sterling professor of mathematics 1921–31; the first Josiah Willard Gibbs professor 1931–32; Josiah Willard Gibbs professor Emeritus 1932 until his death at New Haven, 22 July 1938. He became naturalized as a citizen of the United States in January 1922.

The Yale authorities recognized the importance of Brown's work in the Haverford period by arranging special facilities for its continuation and undertook to provide the funds required for both the preparation and the publication of his *Tables of the Motion of the Moon* (3 vols., 1919). These tables have been uniformly used in nautical almanacs of the world since 1923, and predicted the 1923 eclipse with surprising accuracy. For an account of many other remarkable scientific achievements, activities, and honors, the reader must turn elsewhere.[1]

Professor Brown contributed also to the popularization of his subject by writing a number of articles, and many reviews of new publications. Like Newcomb, he delighted in high climbing on Swiss mountains; in early life he was an expert oarsman. Professor Schlesinger has told us that he was an authority on Gilbert and Sullivan operas, on the Bab Ballads, and on Lewis Carroll's poems, all of which he could recite from memory without hesitation. In youth he expected to be a concert pianist, and his musical settings of Haverford College songs were published. He sang in choruses and choirs, and at one time he was president of the Oratorio Society in New Haven.

He was never married.

R. C. ARCHIBALD

WILLIAM WALLACE CAMPBELL (1862–1938)

Fellow in Class I, Section 1, 1911

William Wallace Campbell, versatile astronomer and able administrator, was one of the leaders whose driving force and imagination helped to devise the new methods that have made modern astronomy such a fruitful field of research.

[1] There is a detailed sketch with a complete bibliography and portrait in R. C. Archibald, *A Semicentennial History of the American Mathematical Society, 1888–1938* (New York, 1938). See also the sketches of Dirk Brouwer in *Science*, 7 Oct. 1938, n. s., vol. 88, p. 316–318, and of F. Schlesinger, in Amer. Math. So., *Bulletin*, vol. 45, p. 343–344.

Campbell was born on a farm in Hancock County, Ohio, in 1862. After receiving his early education in country schools, he entered the University of Michigan, graduating with the B.S. degree in 1886. Campbell spent two years as professor of mathematics at the University of Colorado, and three years as instructor in astronomy at the University of Michigan before joining the staff of the recently-founded Lick Observatory, on Mt. Hamilton, in California, in 1891.

His early work at Lick provided a clear indication of the pioneering qualities that were soon to make him a leader among astronomers of the world. The possibilities of the spectroscope as a tool for research had just begun to be exploited, and Campbell set out to make full use of this exciting instrument in connection with the 36-inch refractor. Visual studies of emission lines in the spectra of stars, nebulae, and comets laid the foundation for the more powerful photographic methods that were to come later. An important series of spectroscopic observations on the planet Mars were undertaken by Campbell in 1894, in an effort to establish the presence or absence of water vapor in the Martian atmosphere. His conclusion that water vapor, if it were present on Mars at all, must be much less plentiful than in the Earth's atmosphere has since been repeatedly verified under much more favorable observing conditions.

The first director of the Lick Observatory, Holden, had been succeeded by Keeler in 1898, and, when the latter died two years later, Campbell, in 1901, was chosen to succeed him. It was during these years that Campbell was establishing the standards of observational precision that have made the name of Lick Observatory synonymous with high-quality observations. The determination of radial velocities had been carried out by visual methods for a few stars and nebulae. With the aid of a specially designed spectrograph, donated by D. O. Mills, and attached to the 36-inch refractor, Campbell, in 1896, set out to measure the radial velocities of all the stars in the northern skies that were brighter than magnitude 5.5. In 1903 a 36-inch reflecting telescope and spectrograph were established by the Lick Observatory at Santiago, Chile, to provide for observations of the southern stars. The successful completion of this ambitious program by Campbell, J. H. Moore, and others, was signalized by the publication, in 1928, of the radial velocities of some 2700 stars, probably the most important single contribution to our knowledge of stellar motions that has ever been made. From the outset the errors of the velocity determinations were almost unbelievably small, averaging about half a kilometer per second. Such precision has not been improved on up to the present day. An interesting and at first secondary outcome of the radial velocity program was the discovery of large numbers of double stars, as evidenced by periodic velocity variations.

An instance of Campbell's versatility in research was his successful securing of observations at seven total solar eclipses, from Mexico and the United States to Australia and India. The spectrum photographs obtained on these expeditions are the basis for D. H. Menzel's fundamental contribution, published in 1932, to our knowledge of the solar atmosphere. Specially-designed equipment was employed by Campbell at the Australian eclipse of 1922 to verify definitely one of the predictions of Einstein's theory of relativity, namely, that light rays passing close by the sun are deflected by the sun's gravitational field.

On his return from the Australian eclipse he was prevailed upon to serve the University of California as president, although nominally retaining his observatory directorship in the hope that he might soon be permitted to return to his work. This hope was never realized and Campbell yielded to retirement in 1930. The illness to which he fell a victim in that year continued to plague him for eight years, and finally brought on his death on June 14, 1938.

During his long and, for astronomy, profitable career, Campbell received many honors in recognition of his service to science, including eight honorary degrees from American and foreign universities, the Lalande and Janssen medals of the Paris Academy, the Draper medal of the National Academy of Sciences of the United States, the Bruce medal of the Astronomical Society of the Pacific, and the Gold Medal of the Royal Astronomical Society of England.

LEO GOLDBERG

HARVEY CUSHING (1869–1939)

Fellow in Class II, Section 4, 1914

Vice-President for Class II, May 1919–May 1923

Harvey Cushing, surgeon, neurologist, medical investigator, bibliophile, historian and writer was born in Cleveland, Ohio, April 8, 1869, and died in New Haven, Connecticut, October 7, 1939. He was the descendant of a long line of doctor folk whose original American ancestor, Matthew Cushing, landed at Hingham, Massachusetts, in 1638. Educated at Yale College and at the Harvard Medical School, he received a thorough training in surgery under William Stewart Halsted at the Johns Hopkins Hospital in Baltimore. There his dynamic and artistic disposition received its major stimuli. There he made friends with William Osler and acquired that love of books that so greatly flavored his writings in the succeeding years. There he learned the scientific method and began his laboratory efforts, and there he acquired the precise and gentle surgical technique that was to allow him to establish the field of neurological surgery.

His consuming ambition and devotion to his profession were above that of most doctors and his restless and perfectionist attitude made him sceptical and critical of much that went on in his day. The result was an output in work and thought of extraordinary value to his profession. After a complete training in general surgery he entered the field of neurological surgery. For thirty years he tilled this field assiduously both in the clinic and in the laboratory. The 330 books, papers and monographs which he wrote deal largely with the nervous system, but the historical contributions and orations on general topics represent an unusual breadth of interest and work. And unheralded are the greater number of hours put in with the manuscripts and efforts of his pupils.

His tireless energy showed little let-down as the years passed by. A serious illness during the World War when he drove himself at top speed in forward hospitals passed by scarcely noticed and in his later years a painful malady of his peripheral vessels was borne with such stoicism that only his intimates knew of his continuous suffering.

It was only natural that such an abounding energy should produce great works. By 1913 when he gave the surgical oration at the International Congress of Surgery, he was one of the most distinguished surgeons of this country. At this time the Harvard Medical School brought him to Boston as Moseley Professor of Surgery and he settled down for his major productive years. Here as Surgeon-in-Chief of the new Peter Bent Brigham Hospital his labors established the safe limits for surgical procedures on the central nervous system. Here he wrote the two-volume life of Sir William Osler for which he received the Pulitzer Prize in Letters in 1926. Here he became the master of a school for surgeons such as only his teacher, Halsted, had achieved before him.

To many he was looked upon as a great teacher, and here indeed lay one of his greatest gifts to posterity, for no master has had a more devoted group of pupils who so obviously have followed in emulation the footsteps of their teacher. His exquisite handling of tissues, his perfect care of the patient, his leaving no stone unturned no matter what the effort, were the lodestones which drew young men to him in great numbers. His method of teaching, the apprenticeship system, was simple, and since Cushing was a man of few words it resulted in teaching through example. It has often been said that Harvey Cushing was a severe task-master. He was when it was necessary, but he certainly never exacted greater labors of his pupils than he set for himself, and it should not surprise us that such an ardent and serious person was impatient with incompetence and slovenliness. His perfectionist attitude brooked no compacts with mediocrity and throughout all his relations with pupils there was always time for wise counsel and friendly advice. The pupils always knew, even without a spoken word, that their interests lay close to his heart.

This dynamic personality has gone from our midst. He greatly enjoyed his association with the American Academy of Arts and Sciences, and we who profited from his association with us make grateful acknowledgment here for his efforts to better the comfort and the happiness of the people of his time.

ELLIOTT C. CUTLER

EDWARD MURRAY EAST (1879–1938)

Fellow in Class II, Section 2, 1911

In the months since Dr. East's death a number of excellent accounts of his life and work have appeared.* They have been written by men who knew him well, and who are capable of evaluating his contributions to science. Since these biographies contain the essential facts with regard to his life and work, it has seemed appropriate for me to confine this account to his career as a teacher. He was, in the opinion of his students, a very great one and it was in that role that I knew him best. I have a very vivid memory of my first meeting with him when I came east to begin graduate work in the spring of 1919. I knew nothing about him personally, aside from the assurance of one of my professors that he was "a very genial and generous man to work with." This was scarcely an adequate preparation for one's first sight of him. I knocked and there was a sharp, clear "come in!" Facing me across the desk was a neatly dressed middle-aged man of average size, whose strong features threw into high relief his direct, determined, impersonal stare. His light, silky hair, already beginning to thin, scarcely veiled the square lines of his skull. Then as always, he was meticulously smooth-shaven, with a large, firm, and expressive mouth. He welcomed me pleasantly and in a quick, business-like fashion arranged details of residence, instruction, and research. He was curt but considerate, and increased my confusion by treating me as an equal.

Those of us who feel that Dr. East was a very great teacher base our opinion on his results rather than on any evident feature of his technique. The training of scholars is an art and artists are recognized by their masterpieces rather than by their techniques. One can only suggest that certain characteristics which in greater or lesser degree were passed on to most of his students were important elements in their training. One of these characteristics was his disregard of all supposed authorities. A small handful of biologists he always spoke of with respect, even when their opinions differed from his. The rest, in conversation at least, were disposed of in vigorous and picturesque terms: "Don't waste time wading through so-and-so's papers; he's a useless old dodo." It was this same characteristic, I suppose, which had given him courage, as a chemist and an outsider, to plunge into corn-breeding, and to tell the experts how it should be done. It was certainly one of his outstanding traits and all of his students learned to judge scientific theories on their own merits and without reference to the eminence of their sponsors.

Another characteristic which he passed on to many of his students was a strong sense of relative error. His clear mathematical mind not only grasped the principle of significant figures in computations, it had seen through to a more basic principle, which applied to all experimentation; refined methods are to be used only when the data are worthy of them. If there are gross errors inherent in the method or in the data, their refinement gives only specious accuracy to the result. He often repeated a remark which he ascribed to one of his teachers, "It is seldom necessary to weigh a ton of hay on a Joly balance."

When the problem merited it, however, no one could be more exacting. He was pleased as a boy when he was able to find data for calculating the percentage of error in his own experiments. Plant labels have more ways of getting shuffled than even most botanists realize. Foreign seeds may contaminate the seed pan; even a well-trained gardener can mix a few plants when transplanting thousands of seedlings; the plant set out in the field may die and be replaced by a volunteer seedling from last year's crop. Over a series of years Dr. East assembled critical data on the percentage of such accidents in his pedigree cultures and calculated the probability that any particular plant was not entitled to the label which it bore.

In passing on to what seems to me was his greatest gift as a scholar or a teacher of scholars, we enter a more debatable field. Disregard of authority and significant accuracy were subjects which he discussed frequently with his students. This other trait went deeper and though he never discussed it, association with him produced

* Emerson, R. A. 1939. Science N. S. **89**: 51.
Jones, Donald F. 1939. Genetics **24**: 2 P. L., frontispiece.
Sax, Karl. 1939. Rec. Gen. Soc. Amer. **8**: 11–12.

a similar attitude in many of his students. This attitude, difficult to put into words, resulted from an appreciation of truth as something relative. To him no working hypothesis was ever so completely proved that it could be taken for granted. One worked not with a set of known laws and another set of unproved hypotheses but with a whole collection of hypotheses (conflicting if need be) which passed from the more likely to the less likely. He possessed the ability to think about facts independently of the hypotheses with which they are usually associated and he stimulated the development of this quality in his students. I suppose this must have been acquired (or at least enhanced) through his close association with William Bateson. It is certainly a characteristically Batesonian attitude and is but one of several fundamental resemblances between the two men.

Like any great teacher he treated his students as individuals. The work of some was closely supervised, others were left largely to their own devices, even when they produced no immediate results. He had in the back of his mind a definite conception of the kind of work a certain student might be doing a decade or so later. In the few cases which I know about personally, time has borne out his estimates. Several of us were very negligent in our dress and he made no more than an occasional amused comment on our lack of hats, neckties, and shoe polish. In the case of Mr. X, however, he was wise enough to see that such negligence would become a real barrier to achievement, and he criticized X repeatedly and severely for his sloppy dress.

Dr. East would have been the first to insist that the outstanding success of his students was due quite as much to the remarkable institution in which he worked as to his own individual efforts. Most of the men trained under him were students at the Bussey Institution of Harvard University, one of the most successful experiments in higher education which has yet been undertaken in this country. A few brilliant biologists, East, Castle, Wheeler, Brues, Ames, and Bailey, were associated informally with a small group of students in an antiquated building far enough removed from the rest of the University to permit the development of group individuality. There was little expensive equipment; when apparatus was needed it was constructed in so far as possible from the materials in the ancient stock room, but there were ample opportunities for growing experimental plants and animals and a rather complete freedom from institutional red tape. The Bussey rapidly became an acknowledged center for biological research and the few scholars trained there have made outstanding records. Practical considerations caused it to be discontinued three years before Dr. East's death. It was, however, a successful experiment and whenever a Bussey man is associated with graduate education he tries, consciously and unconsciously, to create the kind of an atmosphere in which he received his own training. In this way Dr. East and his colleagues continue to influence graduate education just as their research is a continuing force in Biology.

EDGAR ANDERSON

OLIVER LANARD FASSIG (1860–1936)

Fellow in Class II, Section 1, 1935

Oliver Lanard Fassig, dean of American climatologists, was born at Columbus, O., Apr. 5, 1860, son of Mathias and Elizabeth (Lanard) Fassig. He was most widely known for his comprehensive treatment of the climate and weather of Baltimore, of Maryland and Delaware, and of Puerto Rico, models for American studies of local climatology. While Robert DeCourcy Ward was interpreting European work in general climatology to America, Fassig was applying European methods to our records. Ward was the teacher interested in principles and broader generalizations, Fassig the Weather Bureau official confronted with an insistent local demand for an interpretation of his station and section records.

Dr. Fassig was much more than a local climatologist, however. Following graduation from Ohio State University, in 1882, he entered the U. S. weather service at Washington in Jan., 1883; serving there three years, except for several months at Fort Myer, for instruction the first year. In Dec., 1885 he was sent to New Haven as assistant in order to study electrical methods at Yale. In 1887 he was returned to Washington, and from the following June served as bibliogra-

pher and librarian till 1896, compiling a great bibliography of meteorology, including some 100,000 titles. He was made chairman of the section on History and Bibliography of the International Meteorological Congress, Chicago, 1893. As Secretary of the Congress, he edited the extensive proceedings. His contacts with meteorologists from abroad led him to take a year's leave of absence to study in Germany, 1896–7. He became a member of the German Meteorological Society.

After his return from Europe Fassig was made assistant at the Baltimore station of the Weather Bureau, and, while at Baltimore, studied at Johns Hopkins, winning the Ph.D. degree in meteorology there (the first in the U. S.) in 1899. His thesis was on the broad pressure relations of distinctive types of March weather over North America. In 1898 he was happily married to Anne Green McCoy, of Annapolis, Md., who survives him. From 1900 to 1905 he was in charge of the Baltimore station, and published his studies of the climate and weather of that city. He also improved observational practice by inventing a rain-time recorder and a sky camera. In 1905 Dr. Fassig was transferred to Mt. Weather to inaugurate the aerological work there, as director of upper air research. Recognition soon came from abroad: he was elected to the International Commission of Scientific Aeronautics.

In 1907 he returned to Baltimore, where he was again in charge until 1909. Dr. Fassig served not only the Weather Bureau, but also the Maryland State Weather Service, and gave instruction in meteorology and climatology at Johns Hopkins from 1896–1909. From 1909 to 1912, in charge at San Juan, P. R., he came to love the tropics, and published on the climate of the island. After 6 years more at Baltimore, 1912–1918, Fassig organized and directed the Signal Corps School of Meteorology during the war, putting about 400 men through a 1½ to 3 months intensive course in meteorology, including observing and forecasting, under three instructors, at College Station, Texas. At this time he was also secretary of the Association of American Geographers, 1918–1919. In 1919, he returned to Puerto Rico to organize the Caribbean weather and climate service of the Weather Bureau.

Now Dr. Fassig became a traveling ambassador among the numerous countries in and about the Caribbean. His pleasing, comfortable manner smoothed his mission, and in 1920 the Caribbean service began to function. Not only did he arrange for the immediate interchange of daily weather reports, especially for hurricane warnings, but also for the month by month rendition for publication of the observations from numerous non-telegraphic stations, for climatological purposes. Dr. Fassig's aerological experience at Mt. Weather could be counted on to bring about his early establishment of pilot balloon observations at San Juan, which from 1919 to 1926 were during the hurricane season only, but from 1926 were continued throughout the year. With the development of aviation, his published paper on the trade winds of the Caribbean has been much in demand. A complete presentation of these upper air observations and an interpretation of the atmospheric circulation over Puerto Rico bulk large in Fassig's comprehensive manuscript on the climate of Puerto Rico. His hurricane forecasting and devotion to duty in spite of personal peril saved hundreds of lives and won for him the great respect of the Puerto Ricans.

In 1930, when Dr. Fassig would have been retired for age in the field service, he was brought to Washington to head the Climatological Division, bringing to its leadership for the first time, a man who was heart and soul a climatologist. In the two brief years before he was retired he made his scientific ideas and enthusiasm felt throughout the service. Foreign recognition came again in his election to the International Climatological Commission, in 1932. In the four years from his retirement until his death, Dr. Fassig, as Research Associate at Harvard, concluded his work on the hundreds of tables and diagrams on the climate of Puerto Rico, spending his winters on the island. He was Visiting Professor at the School of Tropical Medicine, 1933–35, continuing a connection as lecturer on climatology there, 1926–30. He was in Washington, D. C., preparing the text on Puerto Rico, when he was injured by an automobile and died two weeks later, December 6.

Dr. Fassig was a quiet, unassuming, unhurried scientist. His interests embraced many phases of science, thus he was a fellow of the Am. Assn.

for the Adv. of Science, a member of the Am. Academy of Arts and Sciences and of the Ecological Society of America. He was a delightful companion: he always had time to tell some amusing story out of his wealth of human experience in a polar relief expedition, in a devastating hurricane in the tropics, or in the run of an active life as observer, forecaster, teacher, and administrator. Absolute fairness and sympathetic understanding characterized his dealings not only with his equals but with those under him. He had the courage to do what he thought right even at considerable personal sacrifice, as when he refused to enter politics on behalf of his chief.

A fuller account of Dr. Fassig's life and work and a portrait is to be found in the Bulletin of the American Meteorological Society, of which he was a charter member (Jan., 1937, vol. 18, pp. 28–34, including a bibliography of 78 titles).

CHARLES F. BROOKS

HENRY FAY (1868–1939)

Fellow in Class I, Section 3, 1909

Henry Fay was born in Williamsburg, Pennsylvania, January 12, 1868. His father, Dr. John Fay, was for most of his life surgeon for the Pennsylvania Railroad. Fay's boyhood was spent in Altoona, Pennsylvania, where he attended the Altoona High School and a private school after which he entered Lafayette College, receiving the A.B. in 1889 and A.M. in 1892. Many years later he was elected a Trustee of Lafayette and was given its Honorary D.Sc. in 1915. Although Fay was never strong, he was always interested in sports, acting as manager of the football team and becoming one of the best collegiate tennis players in Pennsylvania.

Following his graduation he entered the laboratory of the Pennsylvania Railroad working part time under Dr. C. B. Dudley, chief chemist of the railroad, and one of the pioneers in the field of materials testing. It was during this period that Fay developed that interest in the field of metals which was to dominate all his later activities.

In 1895 he received the Ph.D. degree from Johns Hopkins after serving for several years as lecture assistant to Ira Remsen. In the fall of 1895 he was called to the Massachusetts Institute of Technology as Instructor advancing rapidly through the lower grades to the rank of professor in 1907.

His work in Analytical Chemistry was outstanding in its precision and attention to detail. It was said of him that he could carry out successfully the most difficult kind of analytical work in evening clothes and without a laboratory apron for protection. He was intolerant of mediocrity and students working under him were impelled to give their best. In spite of his great reserve he inspired not only the respect but deep affection of those who came to know him well. His many kindnesses to students in the way of friendly advice and often financial help are known only to those who benefited. Those of us who were closely associated with him often suspected that he had helped a boy when help was needed and occasionally we learned it from the boy himself, never from Fay.

His early interest in the application of the microscope to the study of the properties of metals is indicated in a paper published in 1898 on "The Segregation of Carbon in a Piece of Boiler Plate." At this time Metallography was virtually an unknown branch of science and Physical Metallurgy did not exist. He was one of the American pioneers in the field that is now universally recognized.

Throughout the rest of his career his activities in this important division of Metallurgy rapidly increased as the publication of some twenty important papers and a great number of minor contributions indicates. He was for seven years consulting metallurgist for the Gillette Razor Company and had much to do with the early developments in the production of razor steel. For nearly fifteen years he was metallurgist for the Watertown Arsenal and many of his most important contributions are in the form of reports to the Chief of Ordnance, most of which were published in "Tests of Metals."

During the Great War, Fay was consultant for the Winchester Repeating Arms Company and his advice was sought by and generously given to various arsenals and to industrial firms making munitions. Although he was urged repeatedly to accept an important position in the Ordnance Department, he felt that he could be of more value to his country as an independent civilian

advisor. The constant physical and mental strain of these advisory duties contributed in no small degree to the beginnings of the disease from which he suffered for more than twenty years.

Dr. Fay's active and productive career ended with the close of the War but for the rest of his life he retained a vivid interest in the rapid developments in his chosen field and was a constant inspiration to those whom he was able to see at his home.

On the fly-leaf of a volume of his collected papers which had been bound for his own use is pasted a little newspaper clipping called "My Creed" which perfectly describes not merely his philosophy of life but his fulfillment of that philosophy.

"To live as gently as I can
To be, no matter where, a man
To take what comes of good or ill
And cling to faith and honor still
To do my best, and let that stand
The record of my brain and hand
And then, should failure come to me
Still work and hope for victory."

ROBERT S. WILLIAMS

WILLIAM EBENEZER FORD (1878–1939)

Fellow in Class II, Section 1, 1918

William Ebenezer Ford, mineralogist, was born in Westville, a suburb of New Haven, Connecticut, on the 18th of February, 1878. He was the son of William Elbert and Caroline Aby (Bishop) Ford. He attended the local schools and prepared there for college; and, entering the Sheffield Scientific School in the fall of 1896, graduated in June 1899. Following his graduation, he was appointed assistant in mineralogy to Professor Samuel L. Penfield, under whom he also carried on post-graduate studies in mineralogy and crystallography. In 1903 he received the doctorate and was thereupon appointed instructor in mineralogy. Professor Penfield's health failed him in the spring of 1900, and, although he was able to direct the research work of advanced students, the routine class work was in that year carried on by the writer, who was then serving as instructor in mineralogy. It is a pleasure to him to recall that Mr. Ford assisted him most efficiently in these duties. Although Dr. Penfield's health improved, the routine work of teaching was carried by Mr. Ford. In 1906, shortly before the lamented death of Dr. Penfield, Mr. Ford was promoted to be assistant professor of mineralogy. In 1920 Mr. Ford was made professor of mineralogy and a member of the Governing Board of the Sheffield Scientific School, which position he held until his death in March 1939.

In 1920 he married Mary Treat Jennings of Rochester, New York, who survives him. Both he and Mrs. Ford enjoyed entertaining their many friends and extended a delightful hospitality both at their home on Lincoln Street, New Haven, and, in the summer, on the Cape where they had a cottage. Mr. Ford was very fond of music, and was himself an accomplished pianist.

Ford was always an effective and successful teacher, and his courses were deservedly popular. His pleasantly informal and friendly manner of handling students, and the large amount of personal attention which he gave them, seldom failed to arouse a genuine interest in the subject he taught, which often continued in after years quite irrespective of the student's particular occupation in life. He was always interested in their personal problems and perplexities, and was regarded with an unusually warm and lasting personal affection by all of his students.

As might be expected of one trained under Dr. Penfield, Mr. Ford's scientific work was characterized by meticulous and thorough investigations covering the morphological, physical and chemical properties of minerals. Although he did not possess the almost uncanny skill and ingenuity as an analyst that was Penfield's, he had a thorough knowledge of chemistry and was successful in associating with himself in his laboratory several men, like Dr. Walter Bradley, who were accomplished analytical chemists, and he used the results of their work most effectively. Almost without exception, the results of his investigations were published in the American Journal of Science. His first paper (with Penfield) appeared during his first year of post-graduate study, and during the next twenty years he was the author, sometimes in collaboration with his associates, Dr. Walter Bradley or others, of fifty papers.

Among the more important of these may be noted one published in 1913 dealing with the optical properties of the amphiboles. Another paper appeared a year later which represented an exhaustive study of the garnet group. A third paper of note was a similarly thorough study of the rhombohedral carbonates. All three of these papers constituted valuable additions to our knowledge of important minerals, and all were primarily concerned with studying the relations existing between the chemical composition of the members of isomorphous mineral compounds, and their physical properties. The first one cited, that on the common amphiboles, was a completion and extension of an investigation begun by Dr. Penfield and F. E. Stanley. While the complexity of the chemical composition of members of this group of minerals made any very definite conclusions regarding the relations between the chemical composition and the physical properties impossible, he was able to show some degree of correlation between the mean indices of refraction and the percentage of the principal oxides present; there also appeared to be some correlation between the amount of total iron present and the value of the extinction angle. In his study of the garnet and calcite groups, respectively, he determined the approximate degrees of miscibility which the various mineral molecules exhibited, and showed that there existed a fairly close correlation between the chemical composition of a given isomorphous mixture, the index of refraction, and the specific gravity. He represented these relationships in a series of diagrams from which, if the values of two of these properties are known, the third can be determined with some accuracy.

At the time when the paper on the rhombohedral carbonates was being prepared, the results of Bragg's x-ray determination of the size of the unit cell and the atomic structure of calcite became available, and it was known that the crystal structure for dolomite, siderite and rhodochrosite must be of the same sort as that of calcite. Mr. Ford discussed this with special reference to the effect of isomorphism on the crystal lattice. He concluded that the lattice for all members of the group and their mixtures remained the same or with at most very small variations insofar as the atomic arrangement and crystal angles were concerned; that the only variation must therefore be in the spacing of the molecular layers which would of course involve a change in the volume of the unit cell. "Complete isomorphous replacement in all proportions would only be expected in the case of two molecules having naturally identical space lattices or with lattices that may change progressively from one end of the series to the other. In other instances the amount of replacement would be conditioned upon the similarity between the two lattices and would proportionally diminish in amount as this similarity decreased." His assembled data seemed to conform well with this theory.

For some years before the publication of the calcite paper in 1917, Mr. Ford had devoted considerable of his time to the work of editing and revising the Dana texts on mineralogy, and as time went on he gave almost his entire attention, not devoted to teaching, to such work. In 1909 the second appendix to Dana's System of Mineralogy was published by Mr. E. S. Dana and Ford, and the third appendix—1915—was entirely Ford's work. He was also the author of the revision of the 13th edition of Dana's Manual of Mineralogy published in 1912. In 1922 appeared under his authorship the third and revised edition of Dana's Textbook of Mineralogy; in 1929 appeared the 14th edition of the Manual; and in 1932, the very largely rewritten and much enlarged 4th edition of the Textbook. In particular, in this edition he had expanded and brought up to date the part dealing with crystallography, including a chapter on crystal structure.

The very great additions, both factual and theoretical, to mineralogical science that had been made since the publication of the sixth edition of Dana's System of Mineralogy in 1892, even with the supplement and the three appendices that had been issued up to 1915, demanded attention if the System were to maintain its position as an up-to-date book of reference. The preparation of a further appendix seemed quite inadvisable, and accordingly Mr. John Wiley of the Wiley firm which had published the Dana texts for over a long period of years proposed to Mr. Ford the project of preparing a new and complete revision of this great work. Mr. Ford agreed to act as editor-in-chief, and began in 1920 to lay out and organize the work and to collect material. Be it

said to Mr. Wiley's credit that it was because of his very real desire to make an important contribution to mineralogy and geology, in which fields of publication his firm had for so long been preeminent, that he was led to propose this project. He had no thought that it would be a financially profitable venture. Indeed, it was likely to be quite otherwise, for it involved, besides the high cost of publication of a book of this type, the employment under the chief editor of other highly trained experts, and the certainty of a relatively limited market for its sale.

Mr. Ford associated with himself from time to time several men with chemical and mineralogical experience, and more particularly had secured the cooperation of Dr. Charles Palache of the Harvard laboratory to supervise the revision and expansion of the crystallographic part of the work. Considerable progress had been made in this really tremendous piece of work when Mr. Ford's health began to fail him, and he realized that additional assistance must be had if the work was to be carried on. He and Dr. Palache made an appeal to the Geological Society of America for aid and received a generous response in the way of a substantial grant of money. About two years ago Mr. Ford, because of his poor health, was obliged to turn the entire project over to Dr. Palache. While it was a great and bitter disappointment to Mr. Ford to have to relinquish a piece of work which he felt was to be the climax of his life's work at the Yale laboratory, he took comfort, as did all with a genuine interest in mineralogy, that the work of preparing the new edition of this standard work should fall to the most capable of all men for the task, Dr. Palache.

Besides his many investigations dealing with individual minerals and mineral groups, the contribution to mineralogical science for which Dr. Ford will be best and most gratefully remembered by teachers and students of the subject will be the valuable service which he rendered with such untiring patience and skill in editing and revising a series of texts that are widely used the world over wherever mineralogy is studied.

CHARLES H. WARREN

TENNEY FRANK (1876–1939)

Fellow in Class IV, Section 3, 1935

Tenney Frank was born in Clay Centre, Kansas, May 19, 1876, and died at Oxford, England, April 3, 1939. He was of Swedish parentage, and passed from the life of a small town to school in Kansas City and thence to the University of Kansas, from which he was graduated in 1898. His subsequent professional studies were pursued, under a group of distinguished classical teachers, at the University of Chicago, where he also was instructor in Latin from 1901 to 1904. There he received the doctor's degree in 1903. From 1904 to 1919 he served as associate professor and professor of Latin at Bryn Mawr College, whence he was called to the professorship of Latin in the Johns Hopkins University which he held until his death. These periods of teaching were punctuated by studies at Göttingen and Berlin in 1910–11 and by various lectureships, at Bryn Mawr College in 1929, the University of California in 1929–30, Oberlin College in 1931, the British Academy in 1931–32, and Oxford University at the time of his death, as well as by service as professor or director of the American School of Classical Studies in Rome in 1916–17, 1922–23, and 1924–25.

Frank's untiring energy appears in the large bulk of his published work. A list of these publications in *The American Journal of Philology* for July, 1939, includes fifteen books—several of them of considerable size, and some of them also published in Italian translation—and over a hundred and fifty periodical articles, not to mention reviews in professional journals. From the rather purely grammatical studies which characterized his earliest period and which were prompted by teachers primarily interested in grammar, he soon passed to his more continuing interests, namely, Roman history and the criticism and elucidation of the greater classical Latin authors, such as Plautus, Terence, Catullus, Cicero, Virgil, and Homer. Though these were both familiar fields, Frank could never be content merely to retrace ground already traversed by others, but his well-stocked mind was ever alert to recognize fresh aspects and to point out untried possibilities. Not all his theories, of course, will stand the test of time, but his additions to our permanent knowledge have been large and important, and his writing is always stimulating to the search for truth. Well acquainted with various other fields, he often brought from dis-

tant areas keys to unlock unfamiliar doors to the classical world. This may be illustrated in his employment of mineralogical criteria for the dating of Roman buildings, and in his crowning work, well advanced at the time of his death, the *Economic Survey of Ancient Rome*, of which four volumes by him or by collaborators under his editorship have already appeared, a fifth being in progress. As editor of *The American Journal of Philology* and an associate editor of *The American Historical Review*, Frank had large influence upon philological and historical studies, and the esteem in which he was held is evidenced by his election as fellow of the British Academy, the Swedish Royal Society of Letters, and our own academy, as well as by membership in the American Philosophical Society, the presidency of the American Philological Association, and the degree of L.H.D. awarded him in 1938 by Union College.

In 1907 Frank married Grace Edith Mayer, a Romance scholar well known for her own work, whose companionship brought strength and finish to his own labors and joy in his avocations of outdoor life and natural history.

Professor Frank, by friendly helpfulness, enthusiasm, and an unusual mingling of personal modesty and intellectual daring, firmly attached to himself both pupils and colleagues. His accomplishment was large and much of it of a pioneer sort, and few American scholars in the fields he cultivated are so often or so respectfully cited by the scholars of other lands.

ARTHUR STANLEY PEASE

EDWARD GARDINER GARDINER
(1854–1907)

Fellow in Class II, Section 3, 1891

Edward Gardiner Gardiner represented the best in New England tradition. His ancestry included George Gardiner who settled at Aquidneck (now Narragansett), Rhode Island, about 1635, and Dr. Sylvester Gardiner, great-grandson of the first settler, who moved to Boston before 1750 and achieved some eminence as a physician and surgeon and whose descendants were prominent in the General Court, in the Church, and at the Bar. Another ancestor was Thomas Handesyd Perkins, a prominent East India merchant.

His father, Edward Gardiner, was an architect, devoted to the high ideals of his profession and a keen sportsman delighting in hunting, dogs, and horses. At first a civil engineer, taking part in the construction of the Connecticut River Railroad, he soon turned to the profession of architecture, which took him to Philadelphia, where he married Sophia Harrison Mifflin, daughter of Samuel Mifflin, one of a distinguished Philadelphia family. From there he moved to New York and built a summer home at New Rochelle, where his second son, Edward Gardiner Gardiner, was born July 29, 1854, There he prospered until the panic of 1857 halted all building. He was killed by a fall from a horse while on a journey to the West in 1859. Whereupon his wife with her five young children came to Boston to make her home among her husband's people.

Her son Edward was a peculiarly sweet tempered and affectionate child. At the Boston Latin School he was preparing for Harvard when trouble with his eyes cut him off from all studies for several years. During this period an inclination toward outdoor life, inherited from his father, led to solitary rambles in the country during which he developed a taste for life in the woods. His scientific career began when he became acquainted with Alpheus Hyatt, then Curator of the Boston Society of Natural History and Professor of Zoology and Palaeontology at the Massachusetts Institute of Technology; and helped him in sorting zoological material at the Society's museum. Later he accompanied Hyatt on repeated cruises along the coast as far north as Labrador, taking his turn in navigating the schooner as well as in the collection of zoological material, and hugely enjoyed both his nautical and scientific experiences. His warm affection for Professor Hyatt and his interest in zoology led him to enter the Institute of Technology, at first as a special student—all that his eyes would permit. Later he became a regular student and in 1882 graduated with the degree of S.B. in Natural History.

He had been in Europe with his grandfather's family in 1874, spending some months in England. On his second trip to Europe following his graduation, he joined the throng of students that was flocking to the laboratory of Rudolph Leuckart at Leipzig. While a student of chick embryology under Hyatt he had been interested in the devel-

opment of a horn-like elevation on the embryonic beak. Under the direction of Leuckart he expanded this study into a detailed investigation of the development of the epidermis and of the beak of birds. His results were embodied in a dissertation that was published separately in 1884 and also in the *Archiv für mikroskopische Anatomie* (**24,** 1885), and in 1884 he was admitted to the Ph.D. degree.

On his return to Boston, now a trained zoologist, he was welcomed in the laboratory of Professor W. T. Sedgwick, then struggling to build up a newly established Department of Biology at the Institute of Technology. Thus began a life long friendship and intimacy between the two men. In 1885 Dr. Gardiner was appointed Assistant, and in 1887 was promoted to Instructor in Zoology. His interest in zoology and in outdoor life led, not only to collecting trips at the seashore, but also to hunting trips in Maine, and to his association with a group of friends in the founding of the Myopia Hunt Club, so called because all the founders were nearsighted.

In 1887 Gardiner took part in an event that was to have far reaching results. It was a meeting to consider a permanent basis for the sea-side laboratory that for several years had been maintained at Annisquam by Professor Hyatt under the auspices of the Woman's Education Association of Boston and the Boston Society of Natural History. This meeting led to the founding of the Marine Biological Laboratory at Woods Hole, with Dr. Gardiner as one of the incorporators. Following the incorporation on March 20, 1888, he was elected to the Board of Trustees together with Professors Hyatt and Sedgwick, W. G. Farlow, Susan Minns, C. S. Minot, and Samuel Wells. He soon withdrew, however, in favor of Miss Florence M. Cushing, who also was active in promoting the organization.

When the Laboratory was opened at Woods Hole, July 17, 1888, under the direction of C. O. Whitman, Gardiner was one of seven investigators to occupy a table. The next year he was appointed Instructor to supervise beginning investigators in need of assistance, and in 1890 he was elected again to the Board of Trustees—a position he held the rest of his life—and he remained on the instructing staff during the summers of 1890 and 1891. During these formative years he was one of the chief supporters of the Director, always ready to help when needed. When in 1890 a steam launch was purchased in Boston, he navigated the boat on its dangerous voyage around Cape Cod to Woods Hole. While not in charge of instruction to students, he frequently lectured to the class and he was one of those called upon for evening lectures before the larger assembly. His own field of investigation was the embryology of compound Ascidians until 1891, when he turned his attention to acoelous Turbellarian worms.

While always a devoted friend of the Biological Department of the Institute of Technology and of its head, teaching had become irksome to Gardiner, and he withdrew in 1892 to give more time to his original work at Woods Hole. The first published result appeared in 1895 in the *Journal of Morphology* (**11,** 155–171). In this paper on the "Early Development of Polycoerus caudatus, Mark," he described the egg and traced the cell-lineage from the first cleavage to the 66-cell stage of this acoelous Turbellarian, and he gave the first published pictures of the remarkable bilateral cleavage stages in this group of worms.

In April 1895 Dr. Gardiner was married to Miss Jane Greene Hooper of Boston, and soon after he built on a knoll overlooking Buzzards Bay a house that has been the summer home of his family ever since. Early in 1894 the growth of the Marine Biological Laboratory had called for a new building to house the botanical department, and when in the spring of 1895 the Trustees found themselves unable to provide the necessary funds, Dr. Gardiner, then a member of the Executive Committee, supported the Director, and, at considerable personal inconvenience, shouldered the whole burden of loaning the money required for the building and its equipment so that it might be completed at the beginning of the summer session. That year he was elected Clerk of the Corporation, a position he held, together with membership on the Executive Committee of the Trustees until 1902 and from 1906 to the end of his life. He was also Secretary of the Board of Trustees from 1896 to 1902.

Gardiner's second paper on Polycoerus appeared in 1898 (*Journal of Morphology,* **15,** 73–110). Here he described, with excellent illustrations, the cytological processes in the egg from

the time of entrance of the sperm to the beginning of the first cleavage. During the winter of 1898–99 Gardiner was at Plymouth, England, engaged in the study of the British Rhabdocoels, another branch of the Turbellarians. He found the Laboratory of the Marine Biological Association a most delightful place to work, and he enjoyed the social opportunities, especially hunting with the otter hounds. In February, 1900, he made a trip to study the fauna of Porto Rico accompanied by Admiral Grinnel and G. M. Gray, who collected much zoological material. The winter of 1902–03 found him again at Plymouth, where he stayed into the summer, continuing his work on the Rhabdocoels.

But the monograph that Gardiner had projected was never completed. He again had been elected Secretary to the Trustees of the Marine Biological Laboratory only three months before a brief illness was ended by his death in Boston, November 4, 1907. Thus abruptly were terminated his scientific studies and his administrative activities, and the Trustees suddenly were deprived of his valuable and efficient services. At that time he was the only original member remaining on the Board, where his long connection with Laboratory affairs and intimate knowledge of its history made him one of the most important members; and his high standing in Boston enabled him to secure valuable assistance for the promotion of the aims of the Laboratory. He had lived to see the Laboratory grow from eight students and seven investigators in 1888 to 47 students and 60 investigators in 1907; and the greater success that followed was to be the fulfillment of his life interest. He was a man whose fine sense of honor and loyalty was shown in his deeds, and the many friendships that he cherished were warm and enduring.

R. P. Bigelow

EDWIN HERBERT HALL (1855–1938)

Fellow in Class I, Section 2, 1883

Edwin Herbert Hall was born in North Gorham, then Great Falls, Maine, on Nov. 7, 1855, the son of Joshua Emery Hall and Lucy Ann Hilborn Hall. He was descended from John Hall, who came to this country from England early in the 17th century, from Anthony Emery, a Huguenot, who landed in Boston in 1635 and from Kenelson Winslow, who immigrated to this country about 1629. For two generations back his ancestors were Maine country folk, sound citizens of the New England type.

Young Hall attended the usual district schools and prepared for college in two years at "Gorham Seminary." He entered Bowdoin before he was sixteen and graduated four years later at the head of his class in 1875. For two years thereafter he taught school. He then turned to science. He writes "I should perhaps have studied law, if I had not felt myself unfitted to advocate a cause in which I did not believe." This quotation is well worthy of note for it is most characteristic of the man.

In the fall of 1877 he entered Johns Hopkins University as a graduate student in physics under Rowland. It is rare that a youthful student entering the field of research scores a bull's-eye as a result of his first investigations. But it was so in Hall's case for in 1879 he discovered the "Hall Effect." The happy result cannot be attributed to good fortune. It must be held as evidence of the skill and persistence of the student and of the vision of his instructor, Professor Rowland. This "Hall Effect" is usually described as a difference of potential which appears perpendicular both to the lines of flow of an electric current and a magnetic field, the magnetic field itself being perpendicular to the current. Hall's thesis contained a quantitative measurement of the effect in gold for various current strengths and for different values of the magnetic field. The importance of the matter may be judged by some remarks made by Lord Kelvin at a meeting of the British Association in 1881, at which Hall read a paper on his discovery—"The subject of the communication" said Kelvin, "is by far the greatest discovery that has been made in respect to the electrical properties of metals since the times of Faraday—a discovery comparable with the greatest made by Faraday." Here then was Hall, at the age of twenty-six, placed in the company of one of the greatest of physicists!

But he had his living to make. In 1881 he was appointed instructor in physics at Harvard, he was assistant professor from 1888 to 1895, professor from 1895 to 1914, Rumford Professor from 1914 to 1921 and Emeritus Professor from 1921

till his death. He grew up with the Department and contributed greatly to its strength and reputation. He received his Ph.D. from Johns Hopkins in 1880 and an LL.D. from Bowdoin in 1905. At the time of his death he was the second in seniority among the Fellows of the American Academy of Arts and Sciences, having been elected in 1883; he joined the National Academy in 1911. He was a member of the Solvay Congress at Brussels in 1924 and of the Volta Congress at Como in 1927. In 1937 he received the medal of the Association of American Physics Teachers for Notable Contributions to the Teaching of Physics.

On August 31, 1882, he married Caroline Eliza Bottum.

Hall's technical contributions fall into two groups. We have seen that he began his career with a great discovery. His second contribution was in a different field, it was not so brilliant but not less important. For through his efforts the teaching of physics in our primary schools, which up to that time had been in a very unsatisfactory state, was greatly improved and placed on a satisfactory basis. All this was not brought about without much sound thinking, and hard work. The result will always stand as a monument to the subject of this notice.

As a university teacher he gave courses in elementary physics for many years and courses in thermodynamics and kinetic theory to more advanced students. His teaching was marked by clarity and thoroughness. No difficulty was ever glossed over; it was followed up and dissected in the most careful manner. He had a very real concern that the listener should understand the situation.

The number of his research students was not large, perhaps not more than a dozen altogether. He took a keen personal interest in them and was rewarded by the strong affection which they all felt for him.

Of course Professor Hall will always be best known by the "Hall Effect" and the major part of his scientific activity as an experimenter and as a writer was connected either directly with this subject or else with closely related matter, including the theory of the flow of the electric current in conductors. He continued working with his own hands at his research with undiminished enthusiasm till the end of his life. In fact, within a few weeks of his death, he was planning new experiments in a new field.

In order to obtain an idea of the extent, variety and value of Professor Hall's work the reader cannot do better than to look over the titles of the 109 papers which he published between 1879 and 1938.

He died in Cambridge, November 20, 1938.

Valuable as were Professor Hall's contributions to the teaching of physics throughout the country, and important as were his contributions to science; it was for the beauty of his character that he will be best remembered by those who knew him well. He was a man of the very highest principles and of unswerving rectitude. But his attitude toward others was marked by charity and a gentle humor. Active in his civic duties—he served during the Boston police strike—no appeal from a good cause went unheeded by him. He was a religious man but he never thrust his convictions on others. He sustained with fortitude illness and family affliction and emerged serene and happy. The community is the better for his example, for he was indeed a most admirable citizen.

THEODORE LYMAN

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ELMER PETER KOHLER (1865–1938)

Fellow in Class I, Section 3, 1914

The passing of Elmer Peter Kohler, Sheldon Emery Professor of Organic Chemistry at Harvard, brought to a close a highly distinguished career of service by a man of unique qualities and altogether rare personality. While others who have made a mark in American science have been properly acclaimed for their inspiring teaching, brilliant research, or leadership, tribute to Kohler on all of these points seems so obviously justified as to constitute merely a starting point for an attempt to draw an adequate characterization. To those who knew Kohler, his accomplishments were largely a matter of course. He was endeared to his friends and students not so much for what he achieved but for the special, unique and unpredictable way he had of doing things. The unusual character of the man is perhaps indicated most strikingly by the fact that although he attended no society meetings, wrote no books, and never delivered a public address, he exerted a profound and quietly dominating influence on the development of American chemistry. This position of importance was not of his own seeking but came to him in natural and logical recognition of his ability, sagacity, and abundant humanism.

Certain of his endearing personal characteristics carry the distinct flavor of Kohler's Pennsylvania Dutch heritage, of which he was immeasurably proud. Born on November 6, 1865, in the village of Egypt, Pennsylvania, he spent his early years at the homestead which had been in the Kohler family for several generations and he retained throughout life the keen interest in farming and in country life gained in this formative period. Plainly engraved in his character was the traditional frankness, frugality, and

friendly humor of the farming folk of the Lehigh valley, and his inborn taste for simple and natural ways of life never left him. His ancestor Jacob Kohler had emigrated from Mühlhausen, Switzerland, in 1728 and, as the first settler in the vicinity, had acquired a large tract of fertile land by warrant from the Penn Heirs. Succeeding generations of Kohlers remained in Egypt as successful farmers, millers, and merchants, and young Elmer in turn learned the methods of farming and acquired a mastery of practical mechanics from working in the mill and with the machines on his progressive father's farm.

Kohler attended the nearby Muhlenberg College at Allentown and in 1886 graduated with honors from the classical course. After graduation he decided to seek a career in the west, and on stopping at Kansas City in quest of employment he encountered in a downtown ticket office a clerk who had come from his Pennsylvania Dutch country. This friendly association gave him an opportunity which he lost no time in seizing. Left for a short time to keep watch on the office, he had an inquiry regarding transportation for a large family to a remote town in Oregon. This required routing over various rail and stage-coach lines under special conditions accorded to western settlers, and presented a problem of considerable difficulty. Although he had neither training for the task nor authorization to make a transaction, Kohler calmly planned the route, made out the complicated tickets, and accepted payment. The ticket agent on his return was at first scandalized, but on discovering that the job had been done to perfection and without a slip he was so impressed with Kohler's ability that on his recommendation Kohler very shortly was given a regular appointment as special passenger agent with the Atchison, Topeka, and Santa Fé Railroad. In this position his assignment was to recruit groups of farmers and their families from the Lehigh Valley region and settle them in the western country along the Santa Fé.

This early experience in railroading was to be of good use many years later. At the outbreak of war in Europe in 1914 Kohler set off without delay to see what he could of the way in which a modern army is mobilized. Disregarding inevitable discomfort and inconvenience he spent some time in Innsbruck before being obliged to make a hurried retreat to Switzerland and thence to England. While waiting in London with countless others for passage home, he formed the habit of meeting incoming trains which were bringing increasing numbers of stranded Americans from Paris. Each time, Kohler would single out a few of his more distressed fellow countrymen and help them find accommodations and the ways and means of returning home. Eventually this unostentatious work came to the attention of a British Army officer assigned to this very duty and, noticing that Kohler's quiet methods were far more effective than his own, he urged Kohler to postpone his return and accept appointment as special agent to expedite the evacuation of neutrals from the war area. In consequence, Kohler for some weeks prior to the opening of the college year found himself journeying back and forth between London and Paris applying practical knowledge gained in youth as a travelling passenger agent on the Santa Fé.

While his early work with the railroad was agreeable and interesting, Kohler before long decided to extend his studies, and after taking the A.M. degree at Muhlenberg in 1889 he entered Johns Hopkins University and took a research problem under Ira Remsen. In this period Hopkins was the leading center in the country for graduate study and research in chemistry, and Kohler made many friends in this stimulating environment. Remsen's discovery of saccharin was but a decade old and he was still exploring the chemistry of orthosulfobenzoic acid derivatives. Kohler's work for the degree under his much admired master was in this field and involved a study of the action of aniline on the interesting chlorides of the acid. Making rapid progress, which in later years he attributed largely to the generous coaching of his good friend H. M. Ullmann, later Head of the Department of Chemistry and Chemical Engineering at Lehigh University, he completed his research and took the Ph.D. degree in 1892.

Kohler's first appointment, which he received immediately following the completion of his work at Hopkins, was to the faculty of Bryn Mawr College, where he was to remain for twenty years. Starting as instructor, and as the first teacher of organic chemistry at Bryn Mawr, he soon became recognized as a scholar of the

first order and a teacher of rare ability, and he advanced steadily and attained a professorship in 1900. Advanced students and beginners alike found in Kohler a stimulating lecturer, an exacting master satisfied only with experimental work of the highest quality, and a man of great personal charm. He exerted considerable influence in the college as a whole, and for many years he not only held the position of head of the chemistry department but was recognized as an informal counsellor to the dominating president, Miss M. Carey Thomas. It was said, indeed, that Kohler was one of the very few individuals from whom the president would accept criticism, and there probably was a close bond of understanding between the two strong and determined personalities. The story is told that on the departure of Professor Keiser for a post at Washington University, President Thomas asked Kohler's advice about the appointment of a successor as head of the department. Kohler in reply stated frankly that he thought himself to be the proper successor, saying "If you can find and attract a better man than Elmer P. Kohler, I shall continue to work here and work with him cheerfully, but if, in my opinion, he is not a better man than I am, you will have my resignation." The appointment went to Kohler.

Some five years elapsed before Kohler's activities in research bore fruit in the form of a publication, his first independent paper appearing in the American Chemical Journal for 1897. The brief delay, however, was due to a piece of bad luck, for his first investigation was anticipated by Victor Meyer. This work was on the alpha-bromination of alkyl bromides in the presence of metal halides, and Kohler had established to his own satisfaction that the reaction proceeds through an elimination—addition mechanism at the very time of the appearance in 1892 of the first of Victor Meyer's classical papers on the subject. Recognizing that a lone and unknown worker could hardly compete with the distinguished German and his corps of assistants, Kohler promptly abandoned work on the problem and sought a field which he could make distinctly his own. This he was not long in finding. The initial papers on aliphatic sulfonic acids (1897–1899), in which considerable attention was given to the chlorides of these acids, bear evident flavor of his dissertation work with Remsen but are characterized less by the nature of the starting point than by the originality of the attack.

This first work abounds in evidence of the touch of a remarkably gifted experimentalist and of the insight of a keen and thoughtful observer endowed with an uncanny faculty for appreciating the significance of seemingly trivial phenomena. In his paper with Margaret B. MacDonald of 1899 the discovery of the α-disulfones and α-ketosulfones is described as follows:

"Among the reaction-products of perfectly pure aliphatic and aromatic sulphone chlorides with a variety of reagents, we have frequently observed a minute quantity of some sulphur compound, that, owing to its insolubility in water, generally forms a scum on the surface of the liquid used. The insolubility of the substance, its stability on heating, and its inertness to reagents, pointed to some kind of sulphone, while the fact that the same substance or similar substances are obtained in a great variety of reactions indicated that only the sulphone chloride is involved in its formation. In the investigation above referred to we noticed that a substance of this kind was formed only in those experiments in which there was protracted heating and an insufficient amount of base. This suggested that the substance might be a disulphone formed by the interaction of a sulphone chloride and a sulphinate:

$$C_7H_7SO_2Cl + C_7H_7SO_2Na = NaCl + \begin{matrix} C_7H_7SO_2 \\ | \\ C_7H_7SO_2 \end{matrix}$$

We have found that this reaction gives a simple and, apparently, a perfectly general method for the preparation of disulphones of this kind."

A similar keen observation concerning a by-product was responsible for the discovery in 1908 of the first free radical having but two aryl residues joined to the trivalent carbon atom.

The passage quoted above is illustrative of Kohler's direct and clear style of writing. He always said that he disliked the laborious process of preparing a manuscript, but even though he bent himself reluctantly to the task the results stand as a joy to the reader. He had a keen critical judgment and seemed neither to miss points of significance nor to push his arguments

beyond the limit of secure evidence. Kohler's papers from first to last are masterpieces of logical exposition; one reads them easily, and with complete confidence in the mature judgment of a true authority.

The special interests which eventually led to Kohler's classical work on unsaturated systems were perhaps germinating during the Hopkins period. In the work which he dropped in deference to Victor Meyer, he had recognized the importance of an ethylenic intermediary in the reaction and had become interested in the catalytic function of metallic complexes. His first published paper described a general method for the preparation of α, β-unsaturated sulfonic acids, and in subsequent work he gave particular attention to the study of various addition reactions of these unsaturated acids. He did not immediately go over to the investigation of α, β-unsaturated carbonyl compounds, but was led into this important field in a fortuitous manner. Interested not only in additions to unsaturated compounds but in the modifying influence of unsaturation on other functional groups, he set out in 1903 to synthesize diphenylstyrylcarbinol (B) in order to explore the gap between the highly reactive triarylcarbinols and the widely different tertiary alcohols having one alkyl and two aryl groups. From all that was known at the time the synthesis which he selected should give a substance of the desired structure (B), and the product obtained responded satisfactorily to a

$$C_6H_5CH = CHCOC_6H_5 + C_6H_5MgBr \rightarrow \quad (A)$$
$$C_6H_5CH = CHC(OH)(C_6H_5)_2 \quad (B)$$

number of diagnostic tests and degradative experiments. There were certain peculiarities, however, which bothered him, and he sensed a certain discrepancy between the observed properties of the compound and the expected behavior. He set out to allay these suspicions and in the following year succeeded in proving conclusively that the product obtained from benzalacetophenone and phenylmagnesium bromide is not diphenylstyrylcarbinol (B) but β, β-diphenylpropiophenone, $(C_6H_5)_2CHCH_2COC_6H_5$, thereby discovering a new mode of addition to α, β-unsaturated ketones. In the first paper (1904) on this important subject Kohler states that "The facts at present available are not sufficient to make it possible to decide, conclusively, between the two formulas (for primary 3,4- or 1,4-addition), but I believe that Formula II (1,4-addition) gives the simplest explanation of all the reactions that have been studied." One is tempted to venture the guess that, thirty-four years later, after the accumulation throughout the whole chemical world of a great body of experimental observations and theoretical speculations concerning additions to conjugated systems, Kohler would have been content with the same statement of the case.

The discovery of the new type of addition reaction opened a wide field, and Kohler lost no time in seizing the opportunity offered. With an increasing number of competent collaborators he was able to push the investigation of conjugated compounds in many directions, and the work as a whole constitutes a major contribution to organic chemistry. His transfer to Harvard in 1912 was followed by a considerable expansion of the research program, for more and more students were attracted to the laboratory of this able investigator. He studied the peculiar form of unsaturation encountered in the three-carbon ring and explored the properties of cyclopropane ketones analogous to the α, β-ethylenic compounds, he included unsaturated substances of the carbocyclic and heterocyclic series in the scope of the work, he studied oxides and lactones having adjacent carbonyl groups, he made comprehensive studies of the necessarily related problems of the tautomerism, isomerism, and configuration of unsaturated compounds, and in short extended his inquiry on unsaturation in all manner of different directions. Any brief appraisal of Kohler's scientific contributions is entirely inadequate, and one can only quote the generally current opinion that the work was truly monumental. It is interesting that in his later years he returned to an early love in the form of the sulfones, investigating in 1935 sulfones having an adjacent ethylenic linkage. Also of interest is the fact that among his first papers from Harvard are those on the chemistry of cyclopropanes, while his latest work, at which death overtook him, was in the field of large-ring cycloparaffins. The first publication on cyclopropanes was with his student J. B. Conant, who later took time from his affairs as President of Harvard to direct the work of completing the researches on higher

cycloparaffins which Kohler had undertaken just two years before his death.

Kohler was appointed to a professorship at Harvard in 1912, became Abbott and James Lawrence Professor in 1914, and Sheldon Emery Professor in 1934. To the sheer delight of beginning students, he conducted for several years the introductory course in elementary chemistry. While he excelled in the art of evolving the fundamental principles in a most stimulating way, his special contribution to methods of higher education was in his famous Chemistry 5, a course of advanced organic chemistry. This course was predominantly theoretical, rather than descriptive, and covered such topics as tautomerism, unsaturation, conjugation, addition and substitution, structure, and configuration. One distinctive feature of Chemistry 5 was the beautifully logical exposition, for the subject seemed to unfold and expand in a manner which in retrospect seemed to the listener to have been truly inevitable, and there are many who treasure their year in the course, quite apart from the technical information gained, as a rare experience in the realm of pure reasoning. Another quality which Kohler instilled into Chemistry 5 was the spirit of active participation by the student in the unravelling of the theme. At intervals, and only when an entirely suitable occasion arose, the lecturer, having developed a background and presented a certain set of facts, would pause with a gleam in his eyes and ask the class what theoretical inferences could be drawn. Any one had a right to speak and any opinion was given whatever consideration it merited. Although we always imagined that the conclusion reached by the group as a whole was no surprise to the lecturer, we invariably had the feeling that the question was honestly put, that anything might happen on the momentous occasion of concerted thought, and that the lecturer was entirely open minded and would promptly recognize any new idea which might develop. This was teaching, and a man who could elicit such a response in his students must have had many a quiet chuckle of satisfaction. To Professor Kohler Chemistry 5 was sacred ground, and he would countenance no abuse. Idle visitors were excluded, whether they were research fellows, younger members of the faculty, or visiting professors, for students were not to be restrained or embarrassed by the presence of those who might have been over some of the ground before.

Kohler used no notes in lecturing, except for an occasional card which he would produce from his pocket for the citation of a table of figures. His material was always perfectly organized, and neatly timed to begin and end on the stroke of the clock; his delivery seemed very easy and natural, and indeed he was a truly magnificent speaker. Strangely enough, he could not be persuaded to accept any outside speaking engagements whatsoever, and even professed to dislike lecturing and stated that it put him under considerable strain. He told one of his former assistants that before every lecture he had the same hollow, sinking feeling which he had experienced at the time of his first college lecture, but that this left him once he started talking. Aside from such of his pupils in whom he had confided or who inadvertently had tried to approach him before a lecture, no one could have guessed that he was nervous before speaking.

The legendary belief that he destroyed his notes each year and made fresh ones has been fully verified. The night before a Chemistry 5 meeting he frequently wrote out his lecture, or a considerable part of it, in neat longhand. The sheaf of papers was then pushed into a drawer of his desk without any classification, and these notes apparently were allowed to accumulate until summer and then discarded. In his long years of teaching, this practice was never abandoned. Certainly Chemistry 5 was different each year. There was a definite continuity, and yet it was evident that the old material each time had been considered afresh, along with any new work having a bearing on the problems under discussion. Few men of any age group have had the energy to keep abreast of the times as Kohler did. He was eternally young, always ready to abandon earlier concepts in the light of new developments, always interested in making full use of the contributions of physicists and physical chemists to the knowledge of organic compounds.

The laboratory work of Chemistry 5 was also unique, and many consider that Kohler's system of problem work is a fine example of the tutorial method of instruction at its very best. During the second semester students whose previous

work had placed them in about the first third of the class were permitted to apply for a problem. They were by no means handed a problem or forced to undertake special work; on the contrary each man had to appear for a personal interview and support his claim to special consideration, and under the shrewd scrutiny of the professor a supposedly bright record of undergraduate attainment often seemed to fade to something of little significance. Entrance to the problem group, furthermore, was only a start on a long road of humbling self revelation. We were all given individual problems personally directed by Professor Kohler, and we started off on our respective ways with great glee and enthusiasm. It was fun to be a scientist and do real research, and some of us ran through the whole problem outlined on the very first day. The next day in consultation we learned that that had not been research but nonsense, and we spent the next few weeks trying to work out the first step of the process. As time went on we gradually began to get some insight into the nature of scientific investigation, we learned to have respect for the difficulties and obstacles, and we perhaps caught a glimpse of the fascination of true research. By the end of the year some men in the problem group had gained an inspiration for a life's work, some had come to see that the temperament and talent of a research worker was not theirs, and we all had had a unique experience enriched above all by personal contact with one whom we admired immensely as a man and whom we respected as a great master.

There was a rare but not easily defined quality in the association which grew up between Kohler and most of his research students. With very few exceptions his pupils in later years cherished for him an intimate and personal affection which was almost filial, and yet these same men could all recall occasions when they had regarded him with the greatest awe and they could narrate first hand instances of the somewhat sharp and caustic way he had of offering criticism. Those who learned to know Kohler eventually found that his occasionally vented criticism left no sting. For one thing, whatever objections he may have raised usually became recognized as entirely sound and very much to the point. That his remarks sometimes seemed sharp may have been because of their utter frankness. He had no use for sentimentality or indirectness, and he did not hesitate to speak the plain truth as he saw it. Because of this honesty of expression, coupled with a critical faculty which was truly remarkable, Kohler brought forth from his students the very finest type of intellectual effort. To give a colloquium talk in which Kohler would see no loose points or weak arguments was regarded by graduate students as the highest possible achievement. That unforeseen criticism usually was forthcoming, and that it had to be accepted as justified, merely made the goal all the more worth working for.

While Kohler's frank and somewhat abrupt ways became recognized by his older students as an interesting and understandable phase of his personality, beginners in research often were a little terrified by him. Whether he did it deliberately or not, his manner with these men usually was such as to put them on their mettle and to goad them on to the best efforts of which they were capable. One former Chemistry 5 student who is now a professor recalls that at an interview Kohler suggested his taking a preparation rather than a problem, saying, with obvious implications, "You are not going on in graduate work, are you?" Although the student had planned to seek employment in the industry at the end of the year, this remark offered such a challenge that he insisted upon a problem and before long decided to work for the Ph.D. degree. Another man, who took Chemistry 5 in his junior year, related the following incident:

"I had the usual interview with Kohler in which we discussed the problem, then checked in and prepared the material and carried out the first reaction which he had suggested. Since I was an undergraduate taking the work without credit, I had assumed that Professor Kohler would use me pretty much as an additional pair of hands, and consequently, when I had done everything we had discussed, I sat around waiting for him to come through the laboratory. He did, and I made my report. Then he asked what I was going to do next. I said I did not know. At that he turned on his heel and told me I could get in touch with him when I had some ideas."

Those who came through such trials by fire as happened to be imposed upon them later learned

to appreciate that the unusual experience, however nettling it had seemed at the time, had been the source of true stimulation. They also came to realize that what sometimes seemed like harsh treatment had been meted out with intent which was entirely benevolent but simply stripped of all sentimentality. Kohler certainly had the interests of his students at heart at all times, but his kindness was of a robust nature which admitted of no softness and of little direct expression. It was only years later that certain of his Ph.D. students discovered that their rather stern master returned some of the personal affection which they felt for him. Others recognized this quality at an earlier stage merely because of the staunch support which he had given them in meeting some emergency. He was deeply concerned in matters pertaining to the health of his students, or to their personal problems and even intimate family affairs, and on all such questions he could be turned to for valuable advice and help. He frequently helped students meet the difficult problem of financing the long period of graduate training, and he handled such matters with great understanding and wisdom. On one occasion he was given a rather considerable sum of money for the specific purpose of enabling one of his promising students to complete his studies for the Ph.D. degree. Kohler decided that it would be best for the man if the money were advanced as required in the form of a loan, rather than given outright and, with the consent of the donor, he followed this plan. The student graduated and in due course the loan was repaid. Kohler then proceeded to loan the money in the same way to half a dozen other students in succession, and finally arranged for the transfer of the grant, with some accumulated interest, to a research fund being raised at another university to support the good work of the original recipient of this rather unique fellowship.

In directing research Kohler had the faculty of guiding the work into profitable channels while placing as much responsibility as possible on the shoulders of the student. His concern to foster originality and independence bore such fruit that he left behind him a long succession of men and women who attained prominence as investigators. One learned many things from this master concerning the principles, methods, and techniques of the science, and one caught something of the enthusiasm and love for research which he kept ever fresh from continued experience. Kohler never gave up doing experimental work with his own hands, and to the end of his career he continued to spend such time as he could find working faithfully and joyfully in the laboratory. True it is that as a bachelor he doubtless had some hours for personal research not available to other scientists of comparable teaching and administrative commitments, but it is also true that he gave himself an unusually meagre allotment of time for relaxation and the indulgence of personal pleasures. Keen interests in the arts and letters, in current affairs and in nature were not allowed to occupy him unduly. He took but a short vacation each summer but, characteristically, he made his relaxation thorough. Going off for a walking trip in the mountains or "to paint the barn," he either left no forwarding address or gave careful instructions that he was not to be approached. When any pressing business was likely to require his attention he would simply remain in Cambridge and forego a vacation. Whatever happened he maintained his tranquility, for he seemed able to take the affairs of an active life at an easy stride and to conserve his abundant energies. According to student legend, once a day was often enough to examine mail, and he would answer only a limited number of telephone calls. Not infrequently, however, the occasion arose when he was in the mood to squander any amount of time for a discussion of chemical phenomena. When a visit from a colleague, assistant, or former student found him in his laboratory or in contemplation of recent experimental observations he liked nothing better than to outline the facts of the case and ask his visitor to try to interpret them or to predict the course of some reaction. This sometimes led to a discussion of the most interesting ramifications, or prompted Kohler to bring forth some of his rare stories and experiences, which he would relate with expansive detail and with great relish and effectiveness.

As at Bryn Mawr, Kohler at Harvard was drawn upon for much counsel on administrative matters. For many years he was a member of the Administrative Board of the Graduate School, and in 1926 he reluctantly took time from his

researches to serve as Acting Dean of the Graduate School in the absence of Dean Chase. In 1934 he took over the chairmanship of the Division of Chemistry and guided the affairs of this body with great wisdom, insight, and fairness. During 1937–1938 he very reluctantly agreed to accept appointment to the committee investigating the Walsh-Sweezy case, and there were many who looked particularly to Kohler for a calm and mature judgment on the matter; unfortunately he did not live to record his opinion. Among other activities, Kohler served on the board of directors of the Harvard Coöperative Society and on committees of the Division of Medical Sciences and the Division of Biochemical Sciences. Outside the University, he for a number of years took an active part in the work of the committee on fellowships in chemistry of the National Research Council. During the war Kohler was called to Washington and placed in charge of research in the Offense Section of the Chemical Warfare Service of the United States Army. Although this branch of the Army's work had been in a state of great confusion, Kohler by virtue of his wide knowledge, his sense for the practical, and his robust leadership rapidly organized the Offense Section into a powerful and efficient unit. Still serving as a civilian, for he declined a proferred commission, he was later sent to Europe as a special observer to represent the Chemical Warfare Service in the inter-allied conference on chemical warfare. Granted leave of absence from Harvard for this service with the Army, Kohler returned to academic work in the fall of 1919.

When overtaken by death in his seventy-second year, Kohler was pursuing with full vigor and with a gay heart his many activities as investigator, teacher, and administrator. His mental vigor and his enthusiasm were maintained undiminished to the day when he unknowingly closed the door on his laboratory and treasure room of chemicals for the last time. After a very brief illness, he died on May 25, 1938

As for honors and distinctions, it is perhaps fair to say that Kohler was offered about all the honors that his friends ventured to think that he might accept. These were not numerous, and they very definitely did not include any awards associated with the delivery of an address, for Kohler assiduously declined any and all invitations to speak in public. It is not easy to say just why he adopted this iron-clad policy, and why he carefully avoided all public and social functions and all society meetings. He did feel that there is often some lost motion in such functions, and he doubtless was influenced by an unfortunate experience at the beginning of his career. After making a special trip to a meeting of the American Association for the Advancement of Science for the sole purpose of hearing a paper in his field, he was thoroughly disgusted when, through entirely unnecessary delays, the paper was crowded off the program and given only by title. On the other hand, he never expressed any criticism of the objectives of scientific gatherings and he did not hesitate to encourage his colleagues to accept speaking invitations. In the writer's opinion Kohler felt that this sort of thing was perfectly all right for those who liked it, but decided that it simply was not to his own particular taste. He had many interests of his own and many demands on his time to which he could honestly respond, and he felt under no compulsion to spend his energies on activities foreign to his inborn ways of life. This decision settled the matter, for once Kohler had set his mind on a course of action which he believed to be right he would steer to that course without any regard for what might be said or thought about it. He also had the remarkable faculty of being able to dismiss the entire subject from his mind until the time was ripe for further action. No matter how serious the problem or what personal considerations were at stake, Kohler did what was necessary and then refused to worry. Probably this quality in the man is attributable to a carefully controlled and objective intelligence whereby he was able to conserve his strength for the most worthwhile efforts. He was not at all averse to putting up a stiff fight for any cause which seemed to him just, although there was so much of both the artist and the practical strategist about him that he would not waste his energies unless the prospects of success looked reasonably bright.

Kohler was elected Fellow of the American Academy of Arts and Sciences in 1914, and Fellow of the National Academy in 1920. He served as Associate Editor of the Journal of the American Chemical Society from January 1931 until the

time of his death. Perhaps one of the most significant distinctions of a life of abundant service was his informally recognized position as one of the foremost authorities on chemistry of his day and as a dominant advisor on academic appointments. With a wide-spread reputation for sagacity and keen judgment, he was consulted on all sides and exercised a profound influence on the advancement of the science.

The particular highlights of Kohler's personality which so endeared him to a legion of students and other friends are difficult to describe to those who did not know him, and to those who did any attempted description is entirely inadequate. He had an abundant fund of humor, but it was of a special brand not easily characterized, he was thoughtful and kind, and yet this often would come out in most unusual ways, and his expressions and mannerisms were so uniquely Kohlerian as to defy classification. Suffice it to say that here was a remarkably gifted scientist and teacher of modest disposition and high ideals, who could bring out the very best in those with whom he came in contact, and who was loved for a rich, colorful, and warmly human personality which delighted the hearts of his friends.

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WALDEMAR LINDGREN (1860–1939)

Fellow in Class II, Section 1, 1912

Waldemar Lindgren is most widely known for his numerous stimulating writings on the processes of ore deposition, his comprehensive philosophy of mineral genesis.

He was born at Kalmar, Sweden, February 14, 1860, and there received his early education. At the age of eighteen he entered the Royal Mining Academy at Freiberg, Germany, at that time the acknowledged leader in the world in the realm of mining, metallurgy and geology. He received his degree of Mining Engineer in 1882, and spent the next year in graduate work in metallurgy and chemistry. In June, 1883, he sailed for America with letters of introduction which procured him a position in the Survey department of the Northern Pacific Railway, then building, and the next year (1884) he became a member of the United States Geological Survey. Here, in the greatest geological organization in the world, he remained until he resigned in 1912. In 1908 he became Chief of the Division of Metalliferous Geology and in 1911 was appointed Chief Geologist of the Survey.

In 1908 the Massachusetts Institute of Technology invited him to give a series of lectures on ore deposits. These were received with such enthusiasm that he returned each year until he was finally persuaded in 1912 to become the William Barton Rogers Professor of Geology and Head of the Department of Geology at the Institute. The lectures given here, the digested results of many years of detailed field work in many parts of the world, found expression in his text, Mineral Deposits, in 1913. Successive editions appeared in 1919, 1928 and 1933. All of these reflect his familiarity with the literature of the world, his personal acquaintance with many regions and his deep understanding of nature's processes. From the appearance of the first edition to the present, his work has been recognized as a textbook and work of reference of first rank in its field.

He published almost 200 research papers and upwards of 2000 abstracts, the latter mostly in the Annotated Bibliography. He was leader of the group who in 1905 established the Journal of Economic Geology. This has now the widest circulation of any geological magazine in the world. He remained throughout his life one of its Associate Editors.

During 1927–28, while chairman of the Division of Geology and Geography of the National Research Council, he was largely responsible for the establishment and financing of the Annotated Bibliography of Economic Geology. He remained in charge of this through 1938, supervising the abstracting of the enormous volume of current literature in all phases of economic geology which appeared annually in all the languages of the world. His thorough knowledge of many languages rendered him peculiarly fitted for this position.

Dr. W. H. Newhouse, his successor at the Institute, says of him, "For decades Lindgren has been recognized as the world's leading student and interpreter of ore deposits. He made important contributions to our knowledge and theory of alterations or changes in the rocks adjacent to fissure veins and igneous intrusions; the process of replacement; the influence of physical conditions on redeposition; the role of igneous processes in the formation of ores; the conception of ore deposition within certain geological periods and provinces; and the importance of colloids in the formation of certain ore deposits."

He was a member of numerous American and foreign societies and past-president of several of the American ones. Amongst the many other honors he received was the Wollaston Medal of the Geological Society of London.

In 1886 Waldemar Lindgren married Miss Ottolina Allstrin of Gothenburg, Sweden, a charming, sympathetic woman and true companion until her death in 1929. He died on November 3, 1939, after an illness of eleven months. Up to his illness he had been in his office at the Institute nearly every day, at work on his research problems, writing and talking with the students and teachers.

Doctor Lindgren was a stimulating teacher and he drew students from many lands. These rapidly became his friends with whom, after leaving school, he kept in helpful touch. In disposition he was kindly and retiring, with a ready joke and smile.

HERVEY W. SHIMER

JACOB GOODALE LIPMAN (1874–1939)

Fellow in Class II, Section 2, 1921

The death on April 19, 1939 of Jacob Goodale Lipman brought to its end the truly extraordinary career of an active, gifted, humane man. Born in Friedrichstadt, Russia, on November 18, 1874, he immigrated with his family to New York in 1888. After a few years in New York City the family moved to a farm in Woodbine, New Jersey and his work on the farm and attendance at the Baron De Hirsch Agricultural School in Woodbine initiated Lipman's lifelong interest in agriculture. His career as a student in the New Jersey State College of Agriculture at Rutgers University (1894–98) and as a candidate for the master's and doctorate degrees at Cornell University (1900–03) was uniformly brilliant, and its promise was realized upon his return to Rutgers in his steady ascent to the Professorship of Agriculture (1913) and the Directorship of the New Jersey Agricultural Experiment Station (1911). During this period Lipman conducted major investigations in soil chemistry and bacteriology that eventuated in his classical book, Bacteria in Relation to Country Life (1908). In addition, during this period he went as lecturer to the Universities of Illinois and Cornell (1906), Tennessee (1909, 1910), Iowa (State College, 1910), Nebraska (1911) and later to Columbia (1920). His remarkable experimental work on the role of soil bacteria in plant nutrition, on nitrogen utilization by plants, on the soil chemistry of sulphur, phosphorus, selenium and other elements led to the award to him as a "great captain among scientific investigators" in 1934 of the Chandler Medal of Columbia University.

Lipman was not only a brilliant investigator in his own right. He encouraged and promoted the activities of a long line of able students whose manifold contributions to scientific agriculture have been internationally applied. As Corresponding Member of various foreign agriculture academies, as editor-in-chief of Soil Science and as editor of other agricultural journals and books, he propagated extensively and continuously the facts and theories of soil science. His assiduous promotion of scientific agriculture was conducted through membership in the leading agricultural societies of the world and by his attendance at numerous international conferences, culminating in his presidency of the first International Soil Congress in 1927.

Lipman's eminence in his field was early recognized by his election to this Academy in 1921. Thereafter honors and responsibilities multiplied. He was the official American delegate to the General Assembly of the International Institute of Agriculture in Rome (1922, 1924, 1926), delegate to various international soil conferences, to the International Nitrogen Conference (1926), the World Dairy Congress (1928), the International Chemical Technical and Chemical Congress of Agricultural Industries (1937). In 1927 Lipman was chosen by English and American philanthropists to report on the agricultural possibilities of Palestine and his judgment of its great potentialities has been amply confirmed by subsequent developments.

In addition to his work for world agriculture Lipman has served his city, his state, his nation. He was a member of the New Brunswick Board of Education and the City Planning Commission, President of the New Jersey Health and Sanitary Association, member of the New Jersey State Teachers' Association, The New Jersey State Chamber of Commerce and State Planning Board. As Director of the State Experiment

Station he developed the plant and activities to a remarkable extent. Its continuous progress has attained world-wide recognition. He served the cause of modern science as one of the testifying educators at the famous Scopes trial. In national affairs his cooperative activities with the United States Department of Agriculture have been long and fruitful. In 1933 President Roosevelt summoned him as consultant on national reforestation and in 1935 appointed him member of the National Resources Board. As director of the Jewish Agricultural Society he assisted in the development of the important back-to-the-land movement among American Jewry.

This man worked hard all his life. He shunned no responsibilities, rested not on his laurels. And throughout a life of incessant and demanding activity he remained a simple, friendly human being. He was a kindly, affectionate husband and father. To his parents, Michael Gregory and Ida Birkahn Lipman, he was always an attentive, devoted son. In ordinary converse the professor, the executive, the hard-pressed administrator gave way to the humorous, wise, democratic man. As friend and counselor to many, Lipman was invariably thoughtful and considerate. He was a wise man, an able man, a courteous man, but above all a good man.

GREGORY PINCUS

ARCHIBALD BYRON MACALLUM (1858–1934)

Foreign Honorary Member in Class I, Section 3, 1930

Archibald Byron Macallum was born at Belmont, Ontario, in 1858. He died on April 5, 1934.

During his early years Macallum was a school teacher in a rural Ontario school and later in the high school at Cornwall, Ontario. In 1883 he became lecturer in biology at the University of Toronto, and in 1890, after physiological studies at Johns Hopkins University and medical studies in Toronto, he was appointed professor of physiology in that University. He retained this post until 1908 and was then elected to the newly founded chair of biochemistry in the same University. This post he held until 1916. In 1917 Macallum became the first chairman of the Canadian National Research Council and in large measure guided the new body in the troubled times of the War. From 1920 until 1928 he was professor of biochemistry in McGill University. He was president of the Royal Canadian Institute from 1895 to 1898, Herter lecturer in New York in 1918, Hatfield lecturer in Philadelphia in 1917, visiting professor at the Peking Union Medical College in 1921. He received honorary degrees from Aberdeen, McGill, Yale, Dublin, and Toronto and was a fellow of the Royal Society of London, the Royal Society of Canada, and a member of the American Philosophical Society and the Association of American Physicians. Macallum was elected to this Academy in 1930.

The influence of Professor Macallum upon teaching and science in Canada was strong and enduring. In the field of general physiology he was perhaps the first Canadian pioneer. His investigations included studies of the distribution of iron, phosphorus, potassium, calcium, and chlorine in cells and tissues and led him to the development of methods of micro-chemical analysis. He was especially interested in the distribution of potassium in plant and animal cells and in the interpretation of his results in their relations to surface tension. He also studied the relation of surface tension to muscular contraction.

For many years Macallum was interested in the relations between sea water and the body fluids and tissues of animals and the bearing of the facts that he carefully assembled on the evolution of marine organisms. Observing that the blood of marine invertebrates resembles sea water as it is found today, while the body fluids of vertebrates differ widely in respect of their inorganic constituents, he suggested the hypothesis that the present composition of the fluids of vertebrates corresponds to that of sea water of the Cambrian or Silurian ocean.

This study, for which he is best known, is a sign of his interest in the broad problems of biology. His breadth of interest, his wide learning, his shrewd judgment, and his effective teaching have greatly influenced Canadian science and seem destined to continue to exert an influence.

LAWRENCE J. HENDERSON

WILLIAM McDOUGALL (1871–1938)

Fellow in Class IV, Section 1, 1922

William McDougall, who died at Durham, North Carolina, November 28, 1938, began his professional career as a research worker in anthro-

pology. He ended it pre-eminent as a psychologist. So intense was his interest in psychology that no one, in this or any earlier time, surpassed McDougall in effort to contribute to the progress, not only of general psychology, but of abnormal psychology and social psychology as well. That he did contribute notably is the consensus even of those provoked to vigorous dissent by some of the principles and views on which he was most insistent.

It might not inaccurately be added that William McDougall had dedicated himself to the scholar's life from boyhood. He was born in Lancashire in 1871, of Highlands Scottish ancestry on his father's side, of English on his mother's. To the fact that he was of a first generation of crossbreds he attributed the individualism, the aloofness, and the critical skepticism which always characterized him, but which did not mask from those who came to know him well the essential fineness and kindliness of his nature.

A precocious child, McDougall, at five entered a boys' school, where for some years he was the youngest but perhaps the brightest pupil. He was only fifteen when, after a year of study at Weimar, he entered the University of Manchester, where he specialized in biology. From Manchester, at nineteen, he moved to Cambridge University, gaining a scholarship in St. John's College and entering as a medical student. He did this with no idea of practicing medicine, but rather because medical studies seemed to him peculiarly desirable "to one who aspires to work in any of the sciences concerned with man."

At Cambridge, and later at St. Thomas' Hospital in London, McDougall worked in many such sciences, his courses including physiology, anthropology, anatomy, pathology, bacteriology, neurology, medicine, and surgery. He had been graduated from Cambridge with the highest honors, and, on completing his studies in London, won a fellowship in St. John's College. Many years later, within a few days of his death, he was elected an honorary fellow of this same Cambridge college in which he had so distinguished himself as an undergraduate.

His hospital days done, McDougall had to make definite choice of an occupation. He had already decided that his must be an occupation giving him opportunity to gain greater insight into the mysteries of human nature. Such an opportunity seemed to be afforded by an invitation to join the Cambridge Anthropological Expedition to Torres Strait. Five months only McDougall spent in the islands of Torres Strait, then went to Borneo to assist Dr. Charles Hose in studying the head hunters. A belated product of these studies was his publication, with Hose, in 1912, of the two-volume work, *The Pagan Tribes of Borneo*, a survey of all aspects of the lives of these peoples. It was in this same year, 1912, that McDougall was elected a fellow of the Royal Academy, thus realizing an ambition of his youthful years as a Manchester student.

But this was some twelve years after his return from Borneo to Cambridge. On returning, McDougall dallied with the thought of making field anthropology his chief endeavor. Largely as a result of reading William James' *Principles of Psychology*, he put aside this idea in favor of laboratory psychology, and began study under G. E. Müller at Göttingen, where he resumed experiments, begun at Cambridge, in the field of color vision. Soon afterwards McDougall himself became a teacher of laboratory psychology at University College, London. From London, in 1904, he went to Oxford as a reader in mental philosophy, a post which he retained to 1920 and one which gave him opportunity to teach psychology in a far broader way than at University College.

His *Physiological Psychology* was published in 1905. Three years later there appeared his *Introduction to Social Psychology*, with its forthright challenge to the mechanists by its emphasis on instinct and purpose, and its demand for an acceptance of psychic causation. Received in many quarters with enthusiasm as being the first serious attempt to make psychology of service to the social sciences, criticism of its basic theory soon was heard. McDougall, far from yielding ground, gave his critics fresh cause for complaint with his *Body and Mind* (1911) to which he defiantly added the subtitle, *A History and Defense of Animism*. Souls might be out of fashion, as William James had said. McDougall for his part felt that a soulless psychology needed radical revision to accord with the facts of human life and to become practically helpful to mankind.

Henceforth, accordingly, he devoted himself

mainly to the task of reinforcing the principles and elaborating the views first stated in his *Social Psychology*. This task was interrupted by the World War, in which McDougall served, first as a private in the French army, then as an officer in the English army in charge of a hospital for victims of shell shock. The war ended, he wrote his *Group Mind*. This appeared in 1920, the year McDougall accepted an invitation to teach at Harvard University. Various motives influenced his acceptance, perhaps not least being the fact that at Harvard he would be a successor to William James. For James was one of the only two psychologists, Stout being the other, of whom McDougal felt himself to be "in some degree the disciple and humble pupil."

He came to America to find that not only the soul but Jamesian psychology itself was somewhat out of fashion, with behaviorism rampantly the mode. Unperturbed, McDougall again hoisted the banners of instinct, purpose, and psychic causation, not only with papers and addresses, but with his books, *Outline of Psychology* (1923) and *Outline of Abnormal Psychology* (1926).

The controversy thus aggravated was not lessened by the interest McDougall displayed in psychical research, a field of inquiry disdained by most psychologists. There was no denying, however, that he had forced psychologists to consider important problems commonly ignored, and no denying his power both as a systematist and as a controversialist. For all the dispute about his findings, McDougall has recorded that he was happy in his new environment. Certainly he did not lack friends, among these being Morton Prince, of whose *Journal of Abnormal Psychology* McDougall had been an associate editor since 1913. It was at his suggestion that Prince broadened the range of the *Journal* to take in social as well as abnormal psychology.

McDougall remained at Harvard until 1927, then became head of the department of psychology at Duke University in Durham, North Carolina. At Duke he continued in his dual role of teacher and productive scholar. *Janus—the Conquest of War, Character and the Conduct of Life, Modern Materialism and Emergent Evolution, World Chaos—the Responsibility of Science, The Energies of Men, Religion and the Sciences of Life, The Frontiers of Psychology, Psychoanalysis and Social Psychology,* and *The Riddle of Life* are the titles of McDougall's books published during his tenure at Duke University. To the end—*The Riddle of Life* was published shortly before he passed away—McDougall maintained his struggle against mechanism. To the end he fought for psychic causation and his purposive or hormic psychology, a psychology "which asserts that active striving towards a goal is a fundamental category of psychology, and is a process of a type that cannot be mechanistically explained or resolved into mechanistic sequences."

Few scientists of equal eminence have been so prolific in authorship. Recently May Smith, of the London School of Hygiene, has issued a bibliography of McDougall's writings and this extends to 150 items. Of his works the most influential probably has been his *Introduction to Social Psychology*, the twenty-third edition of which, a revised and enlarged edition, appeared in 1936. His *Outline of Psychology* and *Outline of Abnormal Psychology* form with the *Social Psychology* a trilogy which deserves to be designated as William McDougall's *magnum opus*.

At Duke University, moreover, McDougall by no means gave all his working time to teaching, reading, and writing. Much time he gave to an unusual series of experiments begun at Harvard and terminated only by his death seventeen years later. This was a series of experiments with white rats, having as its purpose a testing of the Lamarckian theory of the inheritance of acquired characteristics.

As far back as his Cambridge days McDougall had rebelled against the prevailing rejection of Lamarck's theory. The theory, he held, had never been put to the test of experiment; its rejection "was purely a deduction from the mechanistic dogma in biology." Finding at Harvard University a small laboratory for animal psychology, McDougall resolved to test the Lamarckian theory himself. At his death the experiments thus initiated had been carried through fifty generations of white rats, and four detailed reports had been published in the *British Journal of Psychology*. Varied most ingeniously, these experiments gradually brought to McDougall the belief that he had demonstrated at least some degree of Lamarckian inheritance. His son, Kenneth, who had long assisted him in this research, continues the experiments.

If these Lamarckian tests constituted one of

McDougall's two avocations, the other was psychical research. His interest in psychical research flowed logically from his craving to master the secrets of human nature, and from his characteristic impatience with dogmatic scientific negation. "It seemed to me a scandal that psychologists should refuse to lend a hand or at least moral support" to organized study of occult phenomena. William James, of course, had been of a like mind, and had actively engaged in psychical research. McDougall went even further than James.

As the latter had done, he accepted election to the presidency of the Society for Psychical Research, the parent English society, which he had joined in 1901. On settling in America he became president of the American Society for Psychical Research; and, in 1925, was to the fore in the founding and organizing of the Boston Society for Psychic Research, remaining on its council to his death. More than this, finding at Harvard University an unused fund for psychical research, McDougall sponsored the first investigation of telepathy at an American university. And later, at Duke University, he specifically introduced psychical research into that institution's field of studies, opening the psychological laboratory to J. B. Rhine and his associates for their experiments in what Rhine has termed extra-sensory perception.

Both of these avocations, the Lamarckian experiments and psychical research, were of course directly linked with McDougall's vocation. It has been truly said of him that he was thinking psychology all the time. Aside from psychology, his one great interest was in his home life. In 1899 he married Miss Anne A. Hickmore, of Brighton, England, and they had five children, Lesley (now Mrs. Paul Brown) Duncan Shimwell, Angus Dougal, Kenneth Dougal, and Janet Aline. In the short autobiography he wrote for Murchison's *History of Psychology in Autobiography*, McDougall paid a beautifully phrased tribute to his wife's helpful influence upon him and to the joy his home life had brought him.

In that same autobiography, on the other hand, he wrote pessimistically of the outcome of his efforts to help man to greater knowledge of himself. His pessimistic doubts were far from being warranted. Since their expression, nearly ten years ago, there has been growing appreciation of the worth of his contributions. One would seem safe in predicting for William McDougall and his purposive psychology a lastingly important place in the history of psychology.

H. Addington Bruce

GEORGE BURGESS MAGRATH (1870–1938)

Fellow in Class II, Section 4, 1933

George Burgess Magrath was born in Jackson, Michigan, on October 2nd, 1870. His father was the Reverend John Thomas Magrath; his mother was Sarah Jane (Herrick) Magrath. The father in his work moved from place to place, so that in the first twelve years of his life George was resident in succession in Jackson and Battle Creek, Michigan, a suburb of Philadelphia and finally a suburb of Boston. In the latter, Hyde Park, and later in Mattapan, George showed an early ability in music, later serving as organist in his father's church, the Church of the Holy Spirit in Mattapan. In later years this interest in music continued, and he participated in the activities of the Cecilia Society, the Handel and Hayden Society, the Harvard Alumni Chorus and the Sängerfest, besides being a regular attendant at the concerts of the Boston Symphony Orchestra, throughout his life.

Three years in Hyde Park High School, one in the Roxbury Latin School, graduating at the head of his class, four years at Harvard College with A.B. magna cum laude in 1894, four years in the Harvard Medical School with M.D. cum laude (the highest honor from that school at that date) in 1898 and a Harvard A.M. in 1899, gives the story of his formal education.

From his graduation to his death Dr. Magrath was a member of the teaching staff of the Harvard Medical School as follows.

1898–1900	Assistant in Pathology
1900–1901	Austin Teaching Fellow in Pathology
1901–1905	Assistant in Pathology
1905–1909	Assistant in Hygiene
1907–1931	Instructor in Legal Medicine
1931–1937	Professor of Legal Medicine
After Sept. 1, 1937	Professor Emeritus

Dr. Magrath was a very excellent teacher. In his earlier days in pathology his demonstrations

were popular with students. He was enthusiastic, systematic and clear in didactic teaching, a quality which became even more evident in his lectures later on, when he was giving instruction in legal medicine. These he aptly, often dramatically, illustrated from his personal experience in a way to make remembered the facts he was bringing to his class.

Trained under Councilman and Mallory and with practical experience at the Long Island, the Carney, the Cambridge, the Faulkner and St. Elizabeth's hospitals, Dr. Magrath became an excellent pathologist. His technique in the performance of an autopsy was masterly, and his keen observation recorded many details, some of which might, and often did, prove of the greatest importance in fixing the responsibility for a crime of violence. In his earlier work, when he was assistant to the secretary of the Massachusetts Board of Health, he began to show qualities, which made so successful his long years in the office of Medical Examiner. He was set to study the adulteration of sausages. Treating these as a body tissue, he hardened, embedded, sectioned and stained. The paucity of striated muscle fibers and the excess of starch granules, which he identified as corn meal, were convincing evidence of the richness of the adulteration of the original sausage.

In 1907 Governor Curtis Guild appointed Dr. Magrath Medical Examiner of the Northern District of Boston, an office which had been created in 1877 and for thirty years had been held by Dr. F. A. Harris. For the next twenty-eight years Dr. Magrath competently filled that position. In this office Dr. Magrath rapidly became recognized as a leading expert in New England in the solution of the problems of crime by violence. His fine basic training in pathology, his skill and exactness in post-mortem examinations, his logical processes of thought and exposition, his intellectual independence, his unquestioned honesty and courage, made of him an expert in court and out, whose opinions carried the greatest weight. To be cross-examined was a challenge to his knowledge and intellectual acumen which he enjoyed; rarely could he be caught unawares by opposing legal talent. More and more were his advice and his opinions sought beyond the bounds of his own district; more and more was his help asked by others in similar offices, so that his influence in legal medicine steadily increased. When New York City was planning changes in its plan of legal medical work, Dr. Magrath was an important advisor.

During Dr. Magrath's twenty-eight years as Medical Examiner he established many important procedures and made precedents, which now largely have become recognized as determining factors of the work of Medical Examiners in relation to Legal Medicine. In this way and by his own individual work Dr. Magrath had an important part in the development here of legal medicine into a science and art deserving of recognition as a significant department of medicine, a development which, started by Dr. Magrath and furthered by the generosity of Mrs. Lee, may be expected to expand and progress under succeeding professors of legal medicine until Harvard will have an actual Institute, in which all phases of the many sided problems of Legal Medicine can be investigated, taught and practiced.

In person Dr. Magrath was a picturesque figure, about which gathered many legends. He was erect and broad chested; with shoulders thrown back and chest forward he created the atmosphere of great physical strength, which in fact he had, as exemplified by his prowess as an oarsman, he for many years appearing, not alone on the Charles for recreation but in crews in various races, often winning both on the Charles and Schuylkill Rivers. His mane of hair, first red, then graying, eventually white, towered over a broad brow and finely chiselled features. These with his habitually worn flowing Windsor tie gave him the appearance of musician or artist rather than medical man. Dr. Magrath was genial, enjoyed social intercourse and was much beloved by a wide circle of friends. Under the exterior that might seem brusque there lurked gentleness and a great sympathetic kindliness, often commented upon by those with whom Dr. Magrath came into contact by reasons of the requirements of his office of medical examiner; what had seemed in advance an ordeal to be faced turned out often to be no ordeal at all on account of these qualities of Dr. Magrath.

Besides membership in the Academy from May 10, 1933, Dr. Magrath had the following organizational activities; Major, Massachusetts

State Guard, World War; Member, American Medical Association, Massachusetts Medical Society, Massachusetts Medico-Legal Society, New England Amateur Rowing Association (pres. 1899–1932), National Association of Amateur Oarsmen (vice-pres. 1928–); Member, Rowing Com. of Olympic Games, 1932; Member, Phi Beta Kappa (hon. 1934), St. Botolph Club, Union Boat Club (Boston), Penn Athletic Club (Philadelphia), Players Club (New York). By nature he was clubable, friendly, a fine companion, loved by many in all walks of life, notably by his fellow members in the St. Botolph Club where, never having married, much of his life centered.

Dr. Magrath died on December 11, 1938, after a brief illness, respected by the Commonwealth of Massachusetts and by Harvard University, both of which he had served so well for so long, and loved by a very large circle of devoted friends, lay and medical.

HENRY A. CHRISTIAN

WILLIAM JAMES MAYO (1861–1939)

Fellow in Class II, Section 4, 1921

Minnesota born, a small town product, for Le Sueur, where he was born, still has less than 2000 inhabitants, William James Mayo in cooperation with his brother, Charles Horace Mayo, made of another Minnesota small town, Rochester, a world known medical center of surpassing efficiency and effectiveness. Why? Because there they utilized modern means for medical diagnosis and surgical practice to give to their patients a conscientiously thorough diagnostic study and a surgical technique perfected by diligent practice, increasingly so as more and more patients sought in Rochester a surcease from suffering in the skillful manipulation of the scalpel and a highly perfected post-operative care. Thought of usually as being a surgical clinic, in its many years of existence more patients have received non-operative than operative therapy at the Mayo Clinic.

After graduation from the Medical School of the University of Michigan in 1883 William James Mayo began at once the practice of medicine in Rochester, Minnesota, with his father, to be joined there in 1888 by brother "Charlie." In this small town the Sisters of Charity had a hospital, St. Mary's, and here began that surgical work that later on was to have international acclaim, and always St. Mary's has been the center about which revolved the growing activities and enlarging housing of the Mayo Clinic.

"Doctor Will," as he was known to junior associates and well nigh countless patients, had the genius of foresight and the wisdom to see that there was a place in the world for a highly organized professional care of the sick combined with the teaching of doctors' young and old and the investigation of disease. Altruistically to this end into the Mayo Clinic went a very considerable portion of the profits, for neither he nor his brother cared for great riches. Believing that the Mayo Clinic could and should play a large role in American medicine for all time and that universities above all other institutions possessed the probability of permanence, he and his brother presented to the University of Minnesota more than two and a half million dollars to endow the Mayo Clinic as a post-graduate school of its School of Medicine. Thus the Mayo Foundation of the University of Minnesota has come into existence to carry on the cordial spirit of "Doctor Will" and "Brother Charlie" in freely showing to all comers what had been learned at the Mayo Clinic.

Of the Mayo Clinic recently Harvey Cushing (Science, Sept. 8, 1939) wrote as follows: "It was, to be sure, a Catholic foundation in which Sisters of Mercy doubtless prayed for the recovery of their patients. But it was not primarily for prayer, however efficacious, that the afflicted as by a magnet came to be drawn to that particular shrine. It was rather the world-wide reputation of two forward-looking men whom I like to remember as they were thirty years and more ago, young and vigorous; each blessed with rare surgical judgment, each with hands which seemed possessed, in an emergency, with an uncanny ability to do, unflustered, just the right thing at the right moment. At this shrine there was plenty of ritual, to be sure, but it was the ritual of the well-drilled, silent, operating room, where for every movement there is a reason; where the incense in the air is not to conceal corruption but to produce painless sleep; where the water in which gloved fingers are dipped is holy only because it is sterile."

William James Mayo was tall, handsome, in-

spiring looking, breathing forth a simple cordiality to patients and strange doctors. Quietly, unassumingly in clinic and operating room he showed and told of his surgery; anywhere he would be looked upon as a great personality; he had a fine and wide influence on the progress of medicine and surgery here and throughout the world. Little surprise is it that widely he was honored as well did he deserve. F.R.C.S., Edinburgh, '05, England, '13, Ireland, '21; F.R.S.M., England, '26; LL.D., Toronto, '06, Maryland, '07, Pennsylvania, '12, McGill, '23, Pittsburgh, '24, Carleton College, '28, Manchester, '29, Temple University, '30, Aberdeen, '33, Minnesota, '35, Notre Dame, '36, Villanova, '37; Sc.D., Michigan, '08, Columbia, '10, Leeds, '23, Harvard, '24, Marquette, '29, Northwestern, '29, Yankton, '37; M.D. in Surgery, University of Dublin, '23, University of Havana, '29; Col. M.C., U. S. A., Brig. Gen., M.O.R.C.; D.S.M. (U. S.); Gold Medal, Nat. Inst. Soc. Sc., 1919; Henry Jacob Bigelow Gold Medal, Boston Surg. Soc., 1921; Com. Royal Order North. Star (Sweden) '27; Finlay D.S.M. (Cuba) '29; Cross of Roy. Order, Knight Com. of Crown of Italy, '32; commemorative plaque of the American Legion presented in person by President of U. S. A., '34; President Am. Med. Assoc., 1906–07; member Nat. Acad. of Sciences; member Am. Acad. of Arts and Sciences; member of many other national and foreign societies.

William James Mayo died July 28, 1939 at the age of 78 only a few months after the death of his brother Charles with whom there had been the closest and most devoted association throughout all the years of their constructively useful lives.

HENRY A. CHRISTIAN

CHARLES LADD NORTON (1870–1939)

Fellow in Class I, Section 2, 1907

Charles Ladd Norton was born in Springfield, Massachusetts, December 11, 1870. His father, Francis Norton, was Treasurer of the city of Springfield but as an avocation was interested in making jewelry, becoming a skilled craftsman in the art. It was in helping his father in metal working that Norton began to develop the unusual manual skill that was characteristic of him throughout his life. Only a few months before his death he was actively engaged in the development of a machine for the manufacture of synthetic textile fibre, doing much of the delicate instrumental work with his own hands.

Although his family had hoped that he would become a minister, his interest in mechanics and electricity was compelling and, after his graduation from high school and a period of service as clerk in his father's office, he went to Technology, graduating in 1893 in the Department of Electrical Engineering. His only job as electrical engineer was during a short period of employment with the Boston Edison Company. In the Fall, after his graduation, he returned to Technology as Assistant in Physics under Silas Holman. He advanced through the grades, finally becoming Head of the Physics Department.

Shortly after Roentgen's discovery of the X-ray, Dr. Francis Williams of the Boston City Hospital realized its potential importance in surgical diagnosis. Norton, with Professors Cross and R. R. Lawrence, became associated with Dr. Williams in the development of the X-ray technique, using an old Crooke's tube as the only available instrument. These men carried out their teaching assignments during the day, but at night they and their home-made equipment were transported in an ambulance to the City Hospital to spend the night taking X-ray pictures of patients from the accident ward.

In 1898 Norton met Edward Atkinson and with him started a long series of studies in Fire Prevention and was actively concerned for many years in the development of fireproof and fire-resisting materials. This led to his design of testing devices of many kinds for high temperature measurements and heat transmission and later to the establishment of the Heat Measurements Laboratory, now an important unit in Technology's instructional and research program. Coordinated with this testing work was Norton's development of asbestos board and asbestos shingles, a field in which he was a pioneer. Later he became interested in refractory materials in general and held a number of patents relating to the manufacture of asbestos wood and refractory bricks of various kinds. He was the author of numerous papers on fire prevention, temperature measurement and refractory material.

In 1930 he became Director of the Institute's

Division of Industrial Cooperation and Research, a position which he filled with distinction up to the time of his death.

In spite of his many activities and responsibilities, Norton would always find time to listen sympathetically to the problems of the younger members of the staff and his sound advice helped them over many a hard spot. His intimate knowledge of all phases of Technology's activities has made his passing a most serious loss.

ROBERT S. WILLIAMS

ARTHUR AMOS NOYES (1866–1936)

Fellow in Class I, Section 3, 1899

I have often thought how much more they need advice about life than about chemistry.

At Pasadena, on June 3, 1936, Arthur Amos Noyes* died. With his passing the scientific world lost a chemist who, for half a century, had been preeminent in developing chemical education and chemical research in America. It is infinitely easier to chronicle his scientific achievements than to give an adequate impression of his personality and of the many ways in which his beneficent influence was exerted to deepen and broaden other lives, as well as to enlarge the scope of scientific and humanitarian work in the two great institutes with which he was associated.

Frederick G. Keyes, who succeeded Noyes as Director of the Research Laboratory of Physical Chemistry at the Massachusetts Institute of Technology, has paid a fine tribute to him:

> "Noyes was an extraordinary man. Nature, in the midst of her apparent prodigal waste, occasionally turns from her molds examples which, even while deepening our sense of the mystery of her purposes, sustain our faith. He was of that rare mold: a civilized man in a world whose soul is largely barbaric. Of envy, hate, hypocrisy, arrogance, lust for place and power,—there was not a discoverable trace in his composition."

Arthur Noyes was descended from Nicholas Noyes, who, in 1663, sailed from England with a little band of venturesome pioneers to settle in America. The town of Newbury, at the mouth of the Merrimac River, was founded by them, but it was the harbor-site of Newburyport where, after eight generations, Arthur Amos Noyes was born, September 13, 1866.

His father, Amos Noyes, an able lawyer of the Essex County Bar, was a scholar well versed in legal and historical lore, facile of expression in speech and writing. Although thirty-five years older than his son, he brought zest and keen judgment to the task of educating the boy, whom he himself instructed in Latin, swimming, rowing, and sailing.

Noyes' mother, Anna Page Andrews, was married at the age of nineteen to a man many years her senior. Thus, she was comparatively young at her husband's death in 1896 and became a close companion to her son. Together they travelled widely, her keen interest in literature and the arts giving him, perhaps, his great delight in poetry. In after years he invariably carried with him, when away from home, a large volume of collected poems.

Noyes' first interest in science was developed by the study of physical geography and physics, but it remained for Oliver Merrill of the Newburyport High School to inspire him with a deep interest in chemistry. At this period began a life-long friendship with another embryonic chemist, Samuel P. Mulliken. These two boys, using as a guide *Steele's Fourteen Weeks of Chemistry* and equipped with crude apparatus of their own design, carried out many experiments in their private laboratories—to wit, the attic and wood-shed of their respective homes.

Upon graduating from high school Noyes, desirous of entering the Massachusetts Institute of Technology but finding himself without funds, decided to attempt the freshman work at home. This he accomplished, mastering all the subjects of the first year except drawing. He entered the sophomore class, aided by the Wheelwright scholarship established for Newburyport stu-

* Based on two articles published in the American Contemporary Series, *Ind. Eng. Chem.*, *23*, *443* (*1931*); and in *Science*, *84*, *217* (*1936*). Other biographical memoirs have been written by R. A. Millikan in *Science*, *83*, *613* (*1936*); by A. A. Ashdown in the *Technology Review*, *38*, *420* (*1936*); by C. A. Kraus in the *Scientific Monthly*, *43*, *179* (*1936*), and by F. G. Keyes in the October 1936 number of the *Nucleus*, published by the Northeastern Section of the American Chemical Society.

dents. In 1886 at the age of nineteen he completed his bachelor's thesis in organic chemistry under F. M. Norton. Continuing in this field for another year, he was awarded the Master of Science degree and appointed assistant in analytical chemistry with full charge of a class numbering about forty. Two of his most promising students, Harry M. Goodwin and George E. Hale, were counted among his best friends in later life.

Noyes, after a year of teaching, went to Leipsic to pursue graduate work in organic chemistry under Wislicenus. While in this laboratory he attended lectures by Wilhelm Ostwald in the newly created field of physical chemistry. He was quick to grasp the opportunities afforded by this rapidly growing subject, made the momentous decision to transfer to Ostwald's laboratory, and in 1890 was awarded the doctorate in chemistry. He returned to America to resume his duties at Technology, and for a decade was actively engaged in teaching analytical, organic and physical chemistry. Meanwhile he published a book in each subject: *Qualitative Analysis of Inorganic Substances* (1895); *Laboratory Experiments on the Class Reactions* and *Identification of Organic Substances* (with S. P. Mulliken, 1899); and *The General Principles of Physical Science* (1902).

The text on qualitative analysis received immediate recognition, and its wide acceptance did much to familiarize chemists of that day with the ionic theory and the laws of chemical equilibrium. The original scheme of analysis was incomplete in the sense that it provided for the separation and detection of the common elements only. Many of the omitted elements were, however, also of common occurrence in nature, and each year new uses were being found for them. Furthermore, the scheme provided no satisfactory tests for estimating, even approximately, the relative quantities of the elements qualitatively detected.

Foreseeing future needs, Noyes initiated an extensive research project to devise a complete scheme of analysis which would include the so-called rare elements and put qualitative analysis on a semi-quantitative basis. This marked the beginning of a long series of investigations carried out with the help of W. C. Bray and many other skillful collaborators. These investigations were published from time to time as the work progressed. There was finally published with Bray, after a quarter century of effort, a monumental treatise of five hundred pages. Noyes himself regarded this as his most important contribution to chemistry.

The second book marked the conception of a bold plan to systematize the complexities of knowledge of the empirical properties of organic compounds. This extremely important systemization was subsequently developed by Mulliken, but Noyes always retained a deep interest in it.

The third book marked the first step in the development of a course of study which embodied the ideals of Noyes in regard to teaching. It was my privilege, from 1905, to aid in the development of this course. The book has undergone many changes and revisions. Its purpose, however,—"to give the student an intimate knowledge of the fundamental principles of chemistry and a training in logical, scientific thinking such as will enable him to attack effectively the problems arising in any one of the branches of chemistry or related sciences,"—has remained unchanged. Charles A. Kraus has truly said—"It was due to Noyes more than to any one man that the method of teaching physical chemistry in America was revolutionized. He constantly emphasized the importance of general physical principles and illustrated their use and application by the problem method."

Through his research in physical chemistry, Noyes championed the cause of the ionic theory when many chemists sought to discredit it. During the first few years of his teaching career he was largely dependent on undergraduate students to carry out the many investigations in this field which absorbed his interest. His policy was to *select* the ablest students, to *interest* them in discovery, and to *train* them in research early in their undergraduate course. His dream during this early period is made clear by the following excerpt from a letter dated November 1, 1901.

> I have made a proposition to the President (Pritchett, M.I.T.) in regard to the establishment of a Research Department. It is rather an audacious proposition to make for a person who hasn't much more property than the obligations involved in the proposition require, but I feel that the highest ambition of my life would be realized if I were in charge of such a

department, and it is a favorite sentiment of mine that:

> Those love truth best who to themselves are true,
> And what they dare to dream of, dare to do.

The President is heartily in favor of the plan, but the Executive Committee has not yet acted upon it.

The progress of the plan is indicated in a second letter dated October 12, 1902.

> All consideration of the establishment of a Research Department has been postponed till next spring when the question of moving the Institute will be settled. I have applied to the Carnegie Institution for grants for my own researches and for those of Whitney and Mulliken, and expect to hear next month whether I get them. Remsen of Johns Hopkins, Smith of Pennsylvania, and Richards of Harvard are the Chemical Committee. What the Carnegie Institution does will also have a bearing on the Research Department's establishment.

Further progress is shown by the following letter to President Pritchett,* dated January 12, 1903.

> I wish to renew, with some modification, the proposition previously made in regard to the organization of chemical research at the Institute. This proposition is as follows:
>
> I will give to the Institute each year for a period of three years, with the expectation of further continuance, the sum of $3000.00, in case the Institute will establish Research Laboratories of Physical Chemistry, which shall be independent of existing departments and under the charge of a director, assign to them adequate space, equip the laboratories (at a cost estimated at $6000); appropriate annually the sum given by me and an additional sum of equal amount for the maintenance of the laboratories and payment of research workers in them, and give recognition and standing to the latter by suitable appointments as regular members of the Institute staff.
>
> The appointment of research workers as members of the Institute staff with gradations corresponding to their experience and efficiency in research, for example, as Research Assistants, Research Associates, and Research Professors, is in my opinion essential to the success of the plan; for in order to attract good men and retain them in this work, it is essential that their position be one of some dignity and that there be some prospect of future advancement.
>
> It is desirable that the laboratories be started at the beginning of the next school year.

This letter well illustrates the practicality of Noyes in considering ways and means to insure the realization of his objectives. There is no record of how he was enabled to meet the financial obligations involved in his "audacious" proposition. It is, however, a matter of common knowledge that he and his close associate, W. R. Whitney, developed (1896–98) and put in operation (at Jamestown, N. Y.) a highly profitable process for the recovery of alcohol and ether vapors lost hitherto in the manufacture of photographic printing paper. It is almost certain that this source of income encouraged Noyes to dare to carry out his cherished project.

On February 10, 1903, the Executive Committee voted to establish the proposed Research Laboratory and made provision for it in a new building.* Noyes was appointed director and given an independent budget. The Laboratory was opened on the twentieth of September, 1903. A grant of $2000 was made during that year to Noyes by the Carnegie Institution of Washington for his own investigations. Two other gifts made to the Laboratory during the first year are worthy of note,—one of $1000 from Willis R. Whitney, and a second of $1000 from a fund founded by William E. Hale.† The Carnegie Institution continued to support the investigations of Noyes over a period of many years, 1903 to 1927. Such grants aggregated the surprisingly large sum of $154,500.

During the first years of his directorship, Noyes maintained the same intimacy with the laboratory group which he had previously maintained with his individual research students. This

* The first two letters were addressed to the author while pursuing graduate work in Germany.

* Owing to the prospect of a new site, this building was hastily erected as a temporary structure. It was, however, carefully planned to suit the needs of the Laboratory.

† Father of George E. Hale.

intercourse was considerably furthered by his purchase of a sizable, seaworthy yawl. During the summer selected groups from the Laboratory were invited to explore the myriad bays and inlets of the Maine coast from Portland to Eastport. Sailing into Bar Harbor with the signal of distress flying was only one of many incidents which furnished abundant material for good-natured chaff at winter reunions.

It was on these cruises that Noyes' real personality, so effectively hidden from the outside world, was unfolded. His associates learned of his almost passionate fondness for poetry, which he would recite with intonation never to be forgotten. This fondness sometimes found expression on unexpected occasions. Once in the class-room, for example, the students were startled to hear him read, in place of the usual lecture in physical chemistry, Kipling's compelling poem, *The Explorer*. They quickly grasped nevertheless that it symbolized,—the urge, the struggle, the reward of research,—and after the first moments of incredulity, listened with rapt attention to the inspiring lines:

Till a voice, as bad as conscience, rang interminable changes
On one everlasting Whisper day and night repeated—So:
Something hidden. Go and find it. Go and look behind the Ranges—
Something lost behind the Ranges. Lost and waiting for you. Go!

As members of the crew the research associates discovered that Noyes habitually started work at four in the morning and ended at eight in the evening; and they began to understand that "infinite capacity for taking pains," which was the key-note of his success. But more than all that, they began to catch the spirit of this gentle, retiring man, albeit a born leader, and, in their own various ways, to profit by it.

This intangible spirit of Noyes permeated the whole laboratory and is evidenced by the extraordinarily large number of men—latterly leaders of science in America—who came in contact with him at an early period of their own development. By way of illustration might be mentioned W. R. Whitney, W. D. Coolidge, G. N. Lewis, W. C. Bray, H. M. Goodwin, C. S. Hudson, Yogoro Kato, C. A. Kraus, K. G. Falk, R. C. Tolman, W. D. Harkins, E. W. Washburn, R. B. Sosman, John Johnston, F. G. Keyes, and many others of this and later periods of his life.

Charles A. Kraus, who was a charter member of the research group, writes about this early period as follows:

> Noyes was an ideal director. While he kept in touch with the work of men engaged on his own problems, he nevertheless gave them complete independence in carrying out such work. In the case of others, who were working on their own problems, Noyes always exhibited helpful interest but never interfered with the individual investigator; every worker in the laboratory not only had an opportunity to solve his own problems but it was expected of him to do so. It was this impersonal point of view with regard to the problems in the Research Laboratory that contributed perhaps more than any other factor to the success of the laboratory. Yet Noyes was always interested in the men themselves and was ready to help them on every occasion.

Noyes personally contributed—for almost seventeen years—half the expense of maintenance of the Research Laboratory. During the last four years of this time he assumed concurrent control of two research laboratories, his own and the Gates Chemical Laboratory in Pasadena. In response to the call from George E. Hale across the continent, to aid in the reorganization of Throop College,* he divided his time between the two places.

The devotion of Noyes to research is shown by the fact that, despite constant physical suffering during the last few years of his life, he found time from his administrative duties to carry out during the summer months with his honors students investigations in his chosen field. Just one month before his death a comprehensive paper on *Strong Oxidizing Agents in Nitric Acid Solution* was submitted for publication. One year after his death, these students concluded and published, in a series of three papers, the final results of these investigations. These were published under his name as well as theirs, with an explanatory

* Later renamed, The California Institute of Technology.

note in which the junior authors "assume full responsibility for imperfections and wish to acknowledge their great debt to Professor Noyes."

The active participation of Noyes in the affairs of the American Chemical Society furnishes the first concrete evidence of his leadership in science. At an early date he perceived the need of a publication devoted to the review of chemical research in America. In 1895, due to his efforts, there appeared a *Review of American Chemical Research.* This was first published as a separate part of the *Technology Quarterly,* and in 1897 it was incorporated in the *Journal of the American Chemical Society,* with the explanatory note:

> This Review which has for two years appeared in the *Technology Quarterly* and as a separate publication, will hereafter be published only in the *Journal* and in the *Technology Quarterly.* Copies of the two preceding volumes may be obtained by addressing the Librarian of M. I. T.

Noyes edited this *Review* from 1895 to 1902. From 1902 to 1906* it was published by the *Journal,* only, and in 1907 it was replaced by *Chemical Abstracts.* Thus Arthur Noyes inaugurated the first review of American chemical research, the progenitor of the more general abstract journal.

Noyes also took an active part in the organization of the Northeastern Section of the American Chemical Society and became its first president in 1898. He presented to the section, over a period of seven years, five papers—two illustrated by experiments and all related to his own work or that of his Research Laboratory. In 1904 he was honored by the presidency of the parent society.

A similar record might be cited of his participation in the councils of the American Association for the Advancement of Science, and of the National Academy of Sciences. In 1927 he was elected to the presidency of the former organization. Among other honors conferred upon him were: the degree of LL.D. from the University of Maine in 1908, from Clark University in 1909, and from the University of Pittsburgh in 1915; the degree of Sc.D. from Harvard in 1909, and from Yale in 1913; the Willard D. Gibbs Medal in 1915; the Davy Medal from the Royal Society in 1927, and the Theodore W. Richards Medal in 1932.

Throughout his entire career Noyes was as much interested in scientific education, taken in its broadest sense, as he was in his own special field. From the first, he was an active member of the faculty of the Massachusetts Institute of Technology, constantly seeking ways to make more effective the principles for which he stood. He became chairman of the faculty in 1906. Technology circles were stirred, at about this time, by the proposal of a merger with Harvard. Many viewed such a step with alarm, considering it to be a definite trend away from the conception of the Institute by its founder, the great educator, William B. Rogers. At meetings of the faculty Noyes opposed the merger, and expressed his own views on education in an article published in the *Technology Review* (1905) entitled, *The Ideals of the Institute.*

Noyes was invited to become acting president of Technology in 1907, a very critical time in its history. The acceptance of this responsibility and honor entailed serious sacrifice and real hardship to one of his temperament and mode of life. Such a position necessitated constant contact with an outside world which he had hitherto purposely shunned. But he gladly accepted this important duty, and during two years he gave much thought to improving the methods of instruction, particularly for students in the first year class, and the conditions of their social life.

A keenly perceptive mind has adjudged Noyes' administration in an article which appeared in the *Technology Review* (1909). The following quotation not only outlines the accomplishments of that period, but also portrays admirably the character and personality of the man.

> In making a review of the two years' administration of Acting President Noyes, one is struck by the fact that the period has been a time, not of transition but of positive achievement and progress. Long and intimate acquaintance with the Institute and its problems made it possible for him to discern such matters as he could deal with fittingly, and to take them up without delay. This knowledge, combined with his courage and straightforwardness,

* Under the editorship of W. A. Noyes.

has made it possible for the Institute to go forward surely and steadily.

The first essential to such advance was a better understanding between the different bodies responsible for the welfare of the Institute. It was fortunate that at the time when these bodies were acutely conscious of this need, the head of the Institute was a man who could bring to bear upon the situation his powers of truth and tact. Thanks in large measure to these powers, conditions have changed. The new day of cooperation has already begun. . . .

The thing of most significance, however, in this brief period of Institute life is the influence, not official but personal, which President Noyes has come to have. It is the result of a force of character which, in impressing itself on others, works always through candor and sympathy. "On occasions when I have talked intimately with students," he remarked in his talk on teaching,* "I have often felt how much more they need advice about *life* than about chemistry." And again, in an interview published at the time of the election of President Maclaurin, he said, referring to his own retirement: "I have no hesitation in saying that I would rather be President of the Institute than to hold any other position in the country provided I felt myself well fitted to fulfill the duties of the place. I have, however, clearly recognized that this would not be for the true interests of the Institute; for it needs at its head a man with a larger working capacity, and with certain other important qualities more highly developed."

Noyes was active in Washington during the World War, and was made chairman of the National Research Council, where he was closely associated with George E. Hale and Robert A. Millikan. At the end of the war he made the important, though reluctant, decision to give up the directorship of the Research Laboratory in Cambridge in order to devote his full time to the new California Institute of Technology.

During the years spent in California, Noyes' interest in science widened. He was devoted to Hale and the success of the 200-inch telescope. He was a member, not only of the Executive Council of the California Institute of Technology but of the Observatory Council which had direct responsibility for the telescope. In his quiet and unobtrusive way, he exerted a profound influence in all departments of the Institute. The educational policies, both graduate and undergraduate, were largely due to him. As Millikan has said,—"he spent more time than any other man on the campus trying to create here outstanding departments of physics, of mathematics, of the humanities, of geology, of biology, and of the various branches of engineering; and what these departments are today they owe, more than they themselves know, to Arthur A. Noyes."

MILES S. SHERRILL

* An address delivered to the members of the instructing staff in March 1908.

JOHN CHARLES PHILLIPS (1876–1938)

Fellow in Class II, Section 3, 1915

John Charles Phillips was born in Boston on the 5th of November, 1876, the son of John Charles and Anna (Tucker) Phillips. He went to Milton Academy and then graduated from the Lawrence Scientific School of Harvard University with the degree of S.B., in 1889, from the Harvard Medical School in 1904, and became a House Officer at the Boston City Hospital immediately after graduation and served there for two years. He never practiced medicine professionally. On January 11, 1908, he married Eleanor Hyde of Bath, Maine, and in due season had four children —John Charles, Madelyn, Eleanor and Arthur. He is also survived by two brothers—William and George Wendell—and by two sisters—Anna and Martha P.—Mrs. Reynal Bolling and Mrs. Andrew J. Peters.

Phillips early developed an interest in travel and exploration which lasted all through his life. How many trips he made to the Canadian Rockies and through the western and northwestern portion of the United States I have no way of telling, but he camped in the Glacier National Park and named many of the prominent geographic features there long before the Park was ever thought of. I know he was in Lower California in 1910.

In 1896 he went with Peary to Greenland. Ten years later he travelled extensively in Japan and Korea with his friend Theodore Lyman.

Lyman returned and Phillips went to South China after tiger, and finally ended up in Peking. First, however, he met at Shanghai his mother and sisters and Miss Hyde and accompanied them on a trip up the Yangstse River. Miss Hyde had gone there with her friend Martha Phillips to visit William Phillips, who was at that time Secretary of the United States Legation to China. In 1907 he was in Mexico with his friend Thomas Pierce. It was on this trip that he bought and gave to the Peabody Museum the superb collection of prehistoric pottery from Casa Grande in Chihuahua. He was always doing things like this wherever he was or wherever he travelled. In 1908 he and his young wife took a long trip in a Dahabieh up the Nile, finally reaching Khartoum. In 1910 he went back to Mexico. In 1912–13 he visited the Anglo-Egyptian Sudan, especially the Blue Nile and Dinder River valleys, with Dr. Glover M. Allen, an old friend and the Curator of Mammals in the Museum of Comparative Zoology at Harvard. In 1914 he went to Mount Sinai, Arabia Petra, and up through Palestine, a long journey by camel, this time with Dr. William Mann. His last extended excursion was in 1923–24 when he travelled far and wide through Kenya, Uganda and the eastern Belgian Congo. On most of these trips he made large and important zoological collections which he gave to Harvard University. Upon these collections many scientific reports were written by several specialists. He gave the Phillips Collection of Heads and Horns, selected specimens representing nearly two hundred and fifty species with a number of world's records, to the Museum in 1929. He also gave the Museum many generous gifts of money to aid in exploration, research, and publication, and also frequently purchased important collections to add to its resources, such as the Armstrong collection of Mexican birds.

Phillips held many important positions in several institutions: He was a member of the Faculty of the Peabody Museum in Cambridge since 1931, as his father had been from 1881 until his death in 1885; and for several years President of the Board of Trustees of the Peabody Museum in Salem. He was Research Curator of Birds in the Museum of Comparative Zoology; long a Trustee of the Boston Society of Natural History; Chairman of the Massachusetts Conservation Council, and of innumerable other committees concerned with field sports, conservation, and forestry. His important services in helping to protect wild life throughout the world will be dealt with elsewhere, as well as his excellent work as "American Observer" at several important International Conservation Conferences. He was a Fellow of the American Academy of Arts and Sciences; a Fellow of the American Ornithologists' Union. He was also for six years President of the Massachusetts Fish and Game Association. He was a founder, and for seven years chairman, of the American Committee for International Wild Life Protection, and was a director of the National Association of Audubon Societies at the time of his death.

Phillips gave to the Trustees of Public Reservations several tracts of land in Boxford, Wenham and Rockport, chosen for wild life refuges and because of their natural beauty. He gave the Bolling grove of Giant Red Woods to the State of California in memory of his brother-in-law Colonel Ray Bolling, the first American officer of high rank to lose his life after America went into the World War.

Phillips joined the Second Harvard Surgical Corps in November 1915, and was commissioned an Honorary Lieutenant in the Royal Army Medical Corps and assigned to General Hospital No. 2, B. E. F. On the completion of that service he returned to this country. In September, 1917, he was commissioned a First Lieutenant in the United States Army Medical Corps, in December, 1917, was made a Captain and in May, 1918, as major he was appointed Commanding Officer of the 33rd Field Hospital of the 4th Regular Army Division. He took part in the Marne-Aisne, Saint-Mihiel and Meuse-Argonne offensives, and afterwards went to Germany with the Army of Occupation. He returned to the United States in July, 1919.

His active research began about 1909 when he was associated with Professor W. E. Castle, at the Bussey Institution, and collaborated in genetical experimentation. I vividly remember going to Jamaica Plain to watch him operate when he first transplanted the ovary of a black guinea pig into a white guinea pig. The white guinea pig thereafter produced black young and proved

again the independence of the germ plasm and the soma. In 1911 and 1914 he collaborated again with Castle in two very important papers published by the Carnegie Institution of Washington on germinal transplantation and on the effects of selection in rats and guinea pigs.

His first ornithological papers appeared in 1901. In 1910 came one recording ten years of observation on the migration of water fowl at Wenham Lake. In 1912 he described a new Puma from Lower California. In this year also appeared his first paper on size inheritance in ducks. He continued for years his work on hybridization and built up an enormous collection of living wild fowl and pheasants which he used in his experiments. His published results of the breeding experiments carried on at his lovely country place at Wenham are among the most important of his many contributions to knowledge.

In 1916 he published a study of the birth rate of Harvard and Yale graduates and at about the same time he began to write concerning conservation of mammals and birds as well as further observations on the waterfowl of Wenham Lake. Then finally in 1922–26 he brought forth the great four-volume *Natural History of the Ducks*, probably the best monograph of its kind which has been done by any American naturalist and one which has been appreciated so that now it is almost impossible to obtain.

In 1928 appeared the *Sportman's Scrapbook*, to be followed by several other volumes of essays on field sports and camping which combine accurate statements of fact and great charm of expression.

Phillips was proud of his family but never spoke boastingly of his ancestors. His first forbear to graduate from Harvard was Samuel Phillips of the Class of 1650, he was directly descended, great grandson, from John Phillips, first Mayor of Boston; and two of his forebears founded Phillips Exeter and Phillips Andover Academies, and no less than eighty-five bearing the name of Phillips have graduated from Harvard College from then to the present time, not all immediate kin of course, but a great many were direct progenitors.

During the last few years he spent his winters at Severn Oaks Plantation on John's Island, South Carolina. It is interesting to note, moreover, that the first Phillips graduated from Harvard thirty years before the founding of the city of Charleston.

Last winter we made a trip together visiting the bird sanctuaries of the National Association of Audubon Societies from northern Florida to the Florida Keys and several years before that John went with me on a visit to the Harvard Botanical Garden at Soledad in Cuba and we spent some time together travelling through the island.

Of all the events of a life which has been perhaps somewhat more varied and fully occupied than the average, these two journeys stand out clearly in my mind as precious and indestructible memories.

Phillips prepared a bibliography of his published works complete from 1900 to 1932 which is to be found in the Library of the Museum of Comparative Zoology at Harvard College.

T. BARBOUR

R. I. P.

On a bleak November afternoon not long ago there stood with bowed head on a little knoll in the Wenham woods a cluster of heavy-hearted, sad-eyed people as a minister read the committal service and John Phillips was laid to rest. Nearby, a small brook wound its way through low bushes and the roots of scattered hardwoods. It was just the sort of cover in which a woodcock might have been most at home. The surroundings could not have been more perfect for the burial place of this beloved true New Englander.

As we turned away from the grave, we heard the sound of a shot close by. When its echo had died away many of us thought how pleased John would have been at this unconscious tribute.

H. J. C.

EDWARD SAPIR (1884–1939)

Fellow in Class IV, Section 2, 1933

Edward Sapir, who died on February 4, 1939, was one of the greatest American students of linguistics and an ethnologist of surpassing brilliance. He was also a man of rare quality.

Sapir was born in Lauenburg, Pomerania,

(January 26, 1884) and was brought to this country in childhood. He attended Columbia University (A.B., 1904; A.M. 1905; Ph.D., 1909) and was initiated into the studies of anthropology and linguistics by Franz Boas. His proficiency in the field of languages was manifested while he was still a graduate student by contributions to Indo-European philology and to Semitics. During the early period of his professional career (research assistant, University of California, 1907–1908; instructor in anthropology, University of Pennsylvania, 1909–1910) he was engaged in the analysis of a number of western Indian languages. At this time he dealt with the entire range of Uto-Aztecan tongues and published numerous significant papers and monographs.

From 1910 to 1925 Dr. Sapir was chief of the division of anthropology, Geological Survey of Canada, and, aside from his administrative duties, gave himself over to research upon the languages and cultures of various northern Indian groups, particularly the Nootka. Although his publications upon the tribes of the Northwest Coast were copious and invaluable, they represent only a fraction of the vast amount of accurate linguistic and ethnological data which he collected. The analysis of this thesaurus has been entrusted to a number of his gifted students. During his sojourn in Canada Sapir worked also upon the Sinitic connections of the extended Athapascan linguistic stock and produced lucid and penetrating papers upon the intricate social organization of the tribes of the Northwest Coast. Professor Leslie Spier, Sapir's colleague at Yale University, to whom I am indebted for the data incorporated in this sketch, informs me that Sapir's interest in the psychological implications of language and culture developed at this period of his career. If such a versatile scholar could be said to have had a paramount interest, perhaps this field represents the sharpest focus of Sapir's endeavors.

In 1925 Dr. Sapir was called to the department of anthropology of the University of Chicago and embarked upon a career of teaching which immediately established him in the forefront of the academic ranks of anthropological science. His vast knowledge, the inspirational character of his teaching, and his ability to correlate formal anthropological knowledge with the realities of contemporary life in civilized society marked him for leadership in attempts to integrate the social sciences. I think it may be said that at this period Sapir was easily the most influential figure in American anthropology. The recognition and honors which come to the scientist of outstanding ability were abundantly bestowed upon him during these years. Sapir was the cornerstone upon which that masterly organizer and teacher, Fay-Cooper Cole, rebuilt the department of anthropology at Chicago.

In 1931 Sapir became Sterling professor of anthropology and linguistics at Yale University and immediately established that institution as a center to which graduate students from all parts of the United States and from foreign countries flocked to receive his superlative instruction not only in linguistics, but in general ethnology and in the psychological and psychoanalytic connotations of language and culture. In these years Dr. Sapir contributed notably to the work of reorganization of the department of anthropology at Harvard University, which had suffered the loss of Professor Roland B. Dixon, by devoting no small part of his time and energy to the instruction of junior colleagues at Harvard who journeyed to New Haven to sit at his feet. A small incident in his career, but an important event for Harvard University, was Sapir's participation, as visiting professor, in the Tercentenary Summer School Session of 1936. In this brief sojourn many of the graduate students and instructors in Harvard University received the benefit of his wisdom and his inspiration.

This writer is incompetent to give any original and authoritative appraisal of Sapir's scientific contributions to anthropology, since they fall into areas of that vast subject which are most remote from his own specialties. It is a matter of common knowledge and of universal agreement that in the field of linguistics Sapir did not fall short of genius. His mastery of the techniques of Indo-European and Semitic philology was probably not less than his very extraordinary and even transcendent skill in primitive languages. But he was no mere grammarian and lexicographer; he brought to the study of linguistics a psychological and cultural insight which, for his students, effected the miracle of a virtual carnal resurrection of the desiccated science of philology.

Sapir's oral and literary talents were scarcely

inferior to his gifts as a philologist. Not only did he understand the psychological implications of language; he could use the English language supremely well. I know this from my own experience as one of his rapt auditors. I am credibly informed by competent students of linguistics that his proficiency in the use of many other languages was equally notable, and that his ear for the reception of language was "perfect." His best known work is "Language" (1921) in which, to quote Spier, "he emphasized the more fundamental characterizations of conceptual types and degrees of synthesis. . . . Essentially, this is emphasis on language as thought rather than as form."

By-products of Sapir's scholarly work are two hundred or more titles of groups of poems, literary and musical criticisms—most of them written in the decade including his later years at Ottawa and the first part of his stay in Chicago. According to his intimate friends these are indicative of that extraordinary feeling for word and sound which were most characteristic of him as an individual and were fundamental to his interest in linguistics.

To the writer, who was not privileged to know Edward Sapir intimately, but enjoyed only the occasional contacts afforded at anthropological meetings and in the course of exchanges of brief visits, certain characteristics of the man were easily discernible. He was shy and held himself aloof from casual acquaintances until he sensed in them a genuinely friendly feeling toward him. As soon as he felt the social atmosphere sympathetic and congenial he unfolded all of his unusual personal charm and became a most brilliant and fascinating companion. His friendship and confidence once extended were enduring. There was nothing devious or calculating in Sapir. He was ready to give of his time and his intellect without thought of return or recompense. He required of the recipients of his favors only that they be honest and sincere. He manifested neither intellectual pride nor intolerance; he showed extraordinary patience and self-control under adversity.

Thus it seems to a somewhat casual colleague at a sister university that the small circle of American anthropologists has lost in Sapir not only one of its most brilliant intellects, but also a man of rare fineness of personality and of a breadth and depth of human understanding which shed lustre upon the very title "anthropologist."

E. A. HOOTON

CHARLES SANFORD TERRY (1864–1936)

Foreign Honorary Member in Class IV, Section 2, 1931

Charles Sanford Terry, eminent historian and musical scholar, died November 5, 1936. The eldest son of Charles Terry and Newport Pagnell Terry, he was born in 1864. He was educated at St. Paul's Cathedral Choir School, King's College School, Lancing College and at Clare College (Cambridge) where he received the degree of B.A. in 1886 and that of M.A. in 1891. In addition the following degrees were bestowed upon Professor Terry: honorary doctor of music at Oxford and Edinburgh, doctor of laws at Durham, Glasgow and Aberdeen, and honorary Ph.D. at Leipzig University. His teaching positions were many: Lecturer in history in Durham College of Science (Newcastle-on-Tyne) at Aberdeen and Cambridge; professor of history at Aberdeen (1903–30). He was also president of the Association of Scottish History. He published many articles and books dealing with various aspects of Scottish history, as well as a "Short History of Europe" (1806–1915).

In an autobiographical sketch for "Who's Who" (England) there is a significant phrase: "hobby, music." For despite his unquestioned eminence as a teacher and writer on the history of Scotland, to the world at large Professor Terry is at once associated with a series of highly informative and charming books dealing with Johann Sebastian Bach and his time. Bach's Chorales (3 vols.) (1915–21), Bach's Original Hymn Tunes (1922), Bach: a Biography (1925), Bach's Cantata Texts, Sacred and Secular (1926), Origin of the Family of Bach Musicians (1929), Johann Christian Bach (1929), Bach's Choral and Chamber Works (1924–35), The Four Part Chorales of Bach (1929), Bach, The Historical Approach (1930), Bach's Orchestra (1932), The Music of Bach: an Introduction (1932). In a field seemingly exhausted by the researches of Spitta, Schweitzer and Parry, these volumes of Professor Terry's are astonishing for freshness

of viewpoint, a scholarly thoroughness which is never pedantic and a vividness of presentation which make his volumes a delight to laymen as well as to musicians. For accurate information on Bach's music, style and environment these studies are indisputably classics. To Professor Terry the musical world must ever remain deeply indebted.

E. B. HILL

GEORGES URBAIN (1872–1938)

Foreign Honorary Member in Class I, Section 3, 1938

Georges Urbain (April 12, 1872–November 5, 1938) was Professor of General Chemistry at the Sorbonne, Director of the Institut de Chimie de Paris, and co-Director of the Institut de Biologie Physico-Chimique. He was a brilliant and a versatile man, a painter of landscapes, a sculptor and a musician of distinction, and one of those, of whom there will be very few more, who are to be credited with the discovery of a chemical element. He discovered lutecium, discovered or assisted in the discovery of celtium, and helped by his numerous researches on the rare earths toward the identification and characterization of several others. His work and his speculation on complexes constitute a fundamental contribution to inorganic chemistry and raise questions for the organic chemist which remain to be answered. His lectures at the Sorbonne attracted large and enthusiastic audiences of students. His writings, always clear and always in beautiful style, are marked by a philosophic interest in their subject, in the implications and connotations of the facts which are reported, and in their historical background.

Urbain's work in music is discussed in an article by Henry Mesmin, "Georges Urbain, Compositeur," in a commemorative volume, soon to be published, which will contain discourses pronounced on the occasion of the scientific jubilee of Georges Urbain, 1938. An article by Pierre Urbain, "Georges Urbain, Peintre et Sculpteur," will appear in the same volume. Paul Job's "Notice sur la vie et les travaux de Georges Urbain," *Bull. soc. chim.*, [V] *6*, 745–766 (May 1939) gives an excellent account of Urbain's scientific work and contains a bibliography which lists 110 scientific papers and 8 books. Other references are—Georges Champetier and Charlotte H. Boatner—"Georges Urbain," *Journal of Chemical Education*, soon to be published (1940). Paul Job—"La carrière universitaire et le jubilé scientific de M. G. Urbain," *Annales de l'Université de Paris, 13*, No. 6, 509 (1938). Ralph Oesper—"Georges Urbain," *Journal of Chemical Education, 15*, 210 (1938). Claude Seymart—"G. Urbain: Le Tombeau d'Aristoxène. Essai sur la musique," *La Revue Musicale*, pp. 179–180 (1924–1925).

TENNEY L. DAVIS

ARTHUR EDWARD WELLS (1884–1939)

Fellow in Class I, Section 4, 1929

Into a life-span of less than fifty-five years Arthur Wells crowded that abundance of achievement which marks the outstanding man. Born at Saxonville, Massachusetts, on July 27, 1884, he gained through some happy inheritance a boundless vitality and a striking capacity for accomplishment, coupled with a genuineness and modesty that later successes could not modify.

It was indicative of his vigor and initiative that, upon graduation in 1906 from the Massachusetts Institute of Technology with the degree of Bachelor of Science in Mining Engineering and Metallurgy, he should immediately head for the virile West and find a position. And it was a forecast of his kinetic career that in the ensuing five years, at lead-silver smelters of the American Smelting and Refining Company at Leadville, Colorado, and at Murray, Utah, he should rise through the levels of assistant chemist, chemist, chief chemist, assistant superintendent and research metallurgist. In 1911, at the age of twenty-seven, he was appointed chief metallurgist at the company's enormous Garfield, Utah, smelter, final link in the chain of operations that draws valuable metal from a mountain of lean ore at Utah Copper, first of the famous "porphyry coppers." This responsible post he held for two years until called to a new type of service.

While at the Murray Smelter in the Salt Lake Valley, Wells had directed investigations relating to the damage which the fumes from smelting sulphide ores cause, when in sufficient concentration, both to vegetation and to animals which subsist thereon. This "smoke problem," involv-

ing a tangled intermixture of legitimate and fraudulent claims by agricultural interests against the smelting companies, had grown to great monetary importance in several regions, besides becoming a fertile ground for unscrupulous or inflammatory political activity. In 1913 the United States Bureau of Mines established the Selby Smelter Commission to investigate alleged smoke damage near San Francisco Bay. Wells was chosen as best fitted to conduct the chemical and metallurgical studies. The results, published by the Government, were chiefly his contributions; he was the first to treat the smoke problem scientifically, through accurate chemical controls and appropriate experimental procedure, and the volume remains the classic authority on this subject.

On completion of this inquiry at the end of 1914, Wells was led to join the Bureau of Mines by the opportunities there offered for broad research in the directions of particular interest to him. During his six years in that organization, he was successively metallurgist, assistant chief metallurgist and assistant supervisor of experiment stations. But during 1917–18 he was "loaned" to the Ordnance Office of the War Department and later became Associate Chief of the Acids, Sulphur and Pyrites Committee of that Board, having charge, in this connection, of the coordination of sulphuric acid production throughout the nation.

In 1920, long controversy and agitation regarding smelter smoke damage in Montana led to the establishment of the Anaconda Smelter Commission, and Wells was placed in charge of the chemical and metallurgical investigations and the preparation of the final report.

During all this work Wells sought to find technical and economic means for removal and especially for utilization of the sulphur from smelter smoke, so that this malign ingredient might be converted into a valuable and beneficent product. Artificial fertilizer seemed the most promising direction of utilization, and Wells was largely instrumental in inducing the Anaconda Company to enter the fertilizer business. He was thus brought into contact also with phosphate, potash and nitrogen resources and utilization, to all of which he made important contribution from the standpoints of science, production and marketing.

For five years from 1921, Wells was retained as consultant by important interests in New York City, including Guggenheim Brothers, J. P. Morgan & Co., Anaconda Copper Mining Company and Indian Refining Co. With marked success he executed commissions that involved such further diverse problems as the investigation of metallurgical and chemical undertakings as a basis for financing, improvement in petroleum refining, examination of the nitrate industry and of copper leaching in Chile, and plans for a cement industry in Alaska.

In 1926, Wells was invited to the chair of nonferrous metallurgy at Harvard. With characteristic energy and thoroughness he plunged into this new phase of his calling. His instruction possessed that directness, practicality and insight which sprang from his temperament, and his students sensed his current knowledge and mastery of his field. While appreciating the attractions of academic life, Wells never felt fully at home within it. To its tempo and its repetitions he was not adjusted. He once remarked that he could give a lecture the first time with some enthusiasm, with no enthusiam the second time, and only with apology the third. Here was revealed a quality of realism and humility none too common in the professorial sphere; also a kind of conflict with his long-confirmed habit of dealing ever with new problems.

During this time, industry was continuing actively to seek his counsel. Although loth to forego these direct contacts with the vibrant world "outside," he was nevertheless unwilling to allow them to embarrass his university work. Finally, with a great deal of reluctance, he resigned from Harvard in 1930, and returned to New York, taking up what proved to be the longest engagement of his career.

With the American Cyanamid Company he had ideal opportunity for the use of his talents in the wide scope of its activities in industrial chemistry. At the time of his death he was a member of the board of directors of the company, chairman of its new projects committee, directly in charge of one of the important producing divisions, and liaison officer between the parent company and affiliated properties engaged in the production of natural raw materials.

After a brief illness of cancer, Wells died at the

Massachusetts General Hospital in Boston on May 24, 1939. In 1907 he had married Charlotte E. Chandler of Brunswick, Me., who survives him at their home in East Orange, New Jersey, together with three sons who have graduated from one or the other of the institutions with which their father was connected.

Wells was known to all his associates as an indefatigable worker. This carried him far. But he also possessed a brilliant mind, effective especially in the analysis of new problems and in grasping their simplest solution. His prime interest was in active accomplishment rather than in the recording of it; but he wrote several important treatises, dealing with sulphur, sulphuric acid, and potash, which were published by the Government. His knowledge covered a surprisingly extended range, and his skill in putting it all to use was shown in his capacities as scientist, research engineer, operator, consultant, educator and executive.

Wells's power was rather that of the quietly spinning dynamo than of the dramatic reciprocating engine. A natural reserve and dignity of manner did not conceal his genial spirit. His capacity for team-work was unusual, and his associates without exception regarded him with esteem and lasting friendship. A vital factor in his conspicuous success was an integrity so inherent that it never needed emphasis.

L. C. Graton

FRANK E. WINSOR (1870–1939)

Fellow in Class I, Section 4, 1933

Frank E. Winsor was born in Providence, Rhode Island, on November 16, 1870, and died in Boston, Massachusetts, on January 30, 1939. He was educated in the public schools of Providence and at Brown University which awarded him the degrees of Bachelor of Philosophy in 1891, Civil Engineer in 1892, Master of Arts in 1895, and Doctor of Science (honorary) in 1929.

Entering engineering practice in 1891, he served on the construction of the Metropolitan Sewerage System of Boston from 1891 to 1895, on the design and construction of the Metropolitan Water Works of Boston from 1895 to 1903 and on the design and construction of the Charles River Dam from 1903 to 1906. From 1906 to 1915, Mr. Winsor was associated with the New York Board of Water Supply on the construction of the Catskill Water Supply System. The Scituate Water Supply of the City of Providence was developed from 1915 to 1926 under his direction. In 1926 Mr. Winsor was appointed Chief Engineer of the Metropolitan District Water Supply Commission of Boston, and he served until the time of his death in bringing in the additional water supply for Metropolitan Boston from the Ware and Swift Rivers. The great earth dam that closes off the Swift River Valley to impound the Quabbin Reservoir has been named the Winsor Dam in his honor.

Endowed with kindness and patience as well as an analytical and judicial mind, his fidelity to all tasks entrusted to him made Mr. Winsor a notable public servant as well as a builder of great and useful public works.

Gordon M. Fair

FREDERICK ADAMS WOODS (1873–1939)

Fellow in Class II, Section 3, 1915

Frederick Adams Woods was distinguished by his work in genetics, especially in tracing the heredity of human character and the effects of this transmission upon the history of nations.

He was born in Boston, January 29, 1873, the son of Solomon Adams Woods (1827–1907), a descendant of Henry Adams (d. Braintree, Mass., 1664), who came from Farmington, Maine, to Boston about 1847 and was a successful inventor and manufacturer of woodworking machinery. His mother, Sarah Catherine Watts, was a studious woman, the daughter of a seafaring man who in later life was devoted to mathematics. Frederick's career was largely determined by this background.

Although living in Brookline, he prepared at the English High School in Boston for the Massachusetts Institute of Technology, where he matriculated in 1890. But he found little of interest in two years of elementary work with not much biology. His intellectual awakening began when he entered the Harvard Medical School in 1894 and came under the influence of Charles Sedgwick Minot, then at the height of his career, working on heredity and rejuvenation and the history of germ-cells. After taking his

M.D. in 1898 Woods was appointed Assistant in Histology, and, besides teaching, helped Minot with his guinea-pigs. In 1899 he began breeding rabbits to obtain a pure black race for crossing with albinos to test Galton's Law of Ancestral Heredity. Four generations gave results which later (1903) furnished material for a paper on Mendel's Laws, with which they were found to be in harmony. Following the lead of Galton, Woods turned to human heredity. His originality and insight are shown by his choice of material, the history of royal families, where he found the best personal and genealogical data. While exploring the College Library for this in old Gore Hall he acquired a delight in books that lasted throughout his life. As early as 1901 at the Chicago meeting of the American Psychological Association he announced his thesis that the influence of environment, as opposed to heredity, in creating mental and moral differences had been overestimated. His evidence appeared in a series of articles in *Popular Science Monthly*, August 1902 to April 1903, followed by one on the correlation between mental and moral qualities. In this and all subsequent work he endeavored to apply quantitative mathematical methods.

In the meantime he was Instructor in the Veterinary School during its last two years (1899–1901) and Instructor in Histology and Embryology in the Medical School, 1901–02. In May 1902 his first printed paper appeared on the "Origin and Migration of Germ-cells in Acanthias" (*Amer. Jour. Anat.*, **1**, 307–320), supporting Weismann's theory of the continuity of the germ-cells and having thus a direct bearing upon the problem of heredity.

In 1903 Woods returned to the Institute of Technology with an annual appointment as Lecturer in Histology and assisted A. W. Weysse. During the next three years he had full charge of instruction in embryology and histology, and afterward lectured occasionally on heredity. He was elected Fellow of the Harvard Travellers Club in 1904, having made a trip around the world. When in Europe he searched in the bookshops and libraries for additional information and portraits to be used in his book, *Mental and Moral Heredity in Royalty* (New York, 1906). He was especially interested in Portugal because there he first observed the correlation between the character of the monarch and the prosperity of the country. When the chief authority on Camoens, Wilhelm Storck, died in 1905, Woods cabled an order to buy his library covering the history of Portugal's Heroic Period. In 1910 Woods was appointed Honorary Curator of Portuguese History in the Harvard College Library. In his second book, *The Influence of Monarchs* (1913), he showed that what was true of Portugal was true of other European countries, except England. His contention was that a major influence in the history of nations is of gametic origin.

Woods was an active member of the American Breeders Association and its successor, the Genetic Association, was member of the Council and Chairman of the Committee on Eugenics, and contributed to the publications of the Association and to other journals. Material that he had been collecting on the prevalence since 1450 of war in Europe was worked over in 1913 and 1914 with the help of Alexander Baltzby. Their book, *Is War Diminishing?*, appeared in 1915. When the entire editorial staff of the *Journal of Heredity* was drafted for the World War, Woods went to Washington and edited the *Journal* from October, 1918, to June, 1919, besides contributing thirteen articles to its pages. At the same time he was appointed, at a-dollar-a-year, Collaborator in the Department of Agriculture, Office of Foreign Seed and Plant Introduction, to gather information of plants eligible for introduction into this country, to review the literature on genetics, and to conduct research; but apparently he did no work in this connection. In 1922 he was a member of the National Research Council.

A chronic bronchitis led Woods to seek a milder climate, and he never resumed residence in Brookline. In 1924 he married the Baroness Marie Thérèse de Lebzeltern-Collenbach, of Austria and New York. After a winter at Port of Spain, Trinidad, and a summer in England, they settled in 1927 at Roma, whence he continued to send contributions to the *Journal of Heredity*. He was Vice-President of the International Congress for Studies Regarding Population Problems at Rome in 1931. He died November 5, 1939.

A pioneer in "Historiometry," the application of statistical methods to the study of the causes and events that are recorded in the histories of nations, he has been called "the American Galton."

R. P. BIGELOW

PRESIDENTS OF THE ACADEMY

1780–1791	James Bowdoin
1791–1814	John Adams
1814–1820	Edward Augustus Holyoke
1820–1829	John Quincy Adams
1829–1838	Nathaniel Bowditch
1838–1839	James Jackson
1839–1846	John Pickering
1846–1863	Jacob Bigelow
1863–1873	Asa Gray
1873–1880	Charles Francis Adams
1880–1892	Joseph Lovering
1892–1894	Josiah Parsons Cooke
1894–1903	Alexander Agassiz
1903–1908	William Watson Goodwin
1908–1915	John Trowbridge
1915–1917	Henry Pickering Walcott
1917–1919	Charles Pickering Bowditch
1919–1921	Theodore William Richards
1921–1924	George Foot Moore
1924–1927	Theodore Lyman
1927–1931	Edwin Bidwell Wilson
1931–1933	Jeremiah Denis Matthias Ford
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34 Robert Murray Haig.....New York, N. Y.
32 Henry Wyman Holmes.....Cambridge
34 Edwin Walter Kemmerer.....Princeton, N. J.
34 Frank Hyneman Knight.....Chicago, Ill.
36 Roswell Cheney McCrea.....New York, N. Y.

34 Robert Morison MacIver.....New York, N. Y.
32 Walter Wallace McLaren.....Williamstown
36 Malcolm Perrine McNair.....Cambridge
32 Leon Carroll Marshall.....Chevy Chase, Md.
33 Edward Sagendorph Mason.....Cambridge
36 Elton Mayo.....Cambridge
34 Richard Stockton Meriam.....South Lincoln
34 Harry Alvin Millis.....Chicago, Ill.
32 Frederick Cecil Mills.....New York, N. Y.
31 Wesley Clair Mitchell.....New York, N. Y.
34 Arthur Eli Monroe.....Cambridge
32 Harold Glenn Moulton.....Washington, D. C.
34 Edwin Griswold Nourse.....Washington, D. C.
32 William Fielding Ogburn.....Chicago, Ill.
33 Robert Ezra Park.....Nashville, Tenn.
32 Leo S. Rowe.....Washington, D. C.
37 Clyde Orval Ruggles.....Cambridge
36 Thomas Henry Sanders.....Cambridge
33 Josef Alois Schumpeter.....Cambridge
32 Carl Snyder.....New York, N. Y.
31 Pitirim Alexandrovich Sorokin.....Winchester
31 Oliver Mitchell Wentworth Sprague....Cambridge
(89) 01 Frank William Taussig.....Cambridge
34 Frederick John Teggart.....Berkeley, Cal.
33 William Isaac-Thomas.....New York, N. Y.
37 Harry Rudolph Tosdal.....Belmont
31 Donald Skeele Tucker.....Belmont
33 Abbott Payson Usher.....Cambridge
34 Jacob Viner.....Chicago, Ill.
38 T[homas] North Whitehead.....Cambridge
32 John Henry Williams.....Cambridge
36 Joseph Henry Willits.....New York, N. Y.
34 Leo Wolman.....New York, N. Y.
34 Carle Clark Zimmerman.....Winchester

CLASS III, SECTION IV—*Administration and Affairs*—30

(25) 32 Charles Francis Adams.....Concord
39 Chester Irving Barnard.....Newark, N. J.
(25) 32 Charles Foster Batchelder.....Cambridge
38 Edmund Ezra Day.....Ithaca, N. Y.
32 Henry Sturgis Dennison.....Framingham
(28) 32 William Lusk Webster Field.....Milton
39 Ralph Edward Flanders.....Springfield, Vt.
38 Horace Sayford Ford.....Belmont
35 Jerome Davis Greene.....Cambridge
39 Henry Ingraham Harriman.....Newton Center
(28) 32 Edward Jackson Holmes.....Boston
34 Henry Plimpton Kendall.....Walpole
32 Thomas William Lamont.....New York, N. Y.
39 Morris Evans Leeds.....Philadelphia, Pa.
34 Clarence Cook Little.....Bar Harbor, Me.
36 Dumas Malone.....Cambridge
33 James Vance May.....Watertown
02 Herbert Putnam.....Washington, D. C.
(28) 32 Alfred Lawrence Ripley.....Andover
34 Erwin Haskell Schell.....Cambridge
38 Charles Seymour.....New Haven, Conn.
35 Henry Lee Shattuck.....Boston
37 Henry Southworth Shaw.....Exeter, N. H.
(28) 32 Payson Smith.....Brookline
33 Albert Warren Stearns.....Billerica
(25) 32 Charles Henry Taylor.....Boston
36 Clair Elsmere Turner.....Arlington
(24) 32 Edwin Sibley Webster.....Brookline
(25) 32 Benjamin Loring Young.....Weston
39 Owen D. Young.....New York, N. Y.

CLASS IV—THE HUMANITIES—204

SECTION I—*Theology, Philosophy, and Psychology*—49

32 Michael Joseph Ahern.....Weston
33 Gordon Willard Allport.....Cambridge
32 James Rowland Angell.....New Haven, Conn.
33 John Gilbert Beebe-Center.....Swampscott
38 Julius Seelye Bixler.....Cambridge
24 Edwin Garrigues Boring.....Cambridge
28 Edgar Sheffield Brightman.....Newton
31 Henry Addington Bruce.....Cambridge
32 Leonard Carmichael.....Tufts College
36 Robert Pierce Casey.....Providence, R. I.
33 J[ames] McKeen Cattell.....Garrison, N. Y.
28 Walter Fenno Dearborn.....Cambridge
18 Edmund Burke Delabarre.....Providence, R. I.
24 Raymond Dodge.....Tryon, N. C.
33 Curt John Ducasse.....Providence, R. I.
38 James Everett Frame.....Princeton, N. J.
37 Clarence Henry Graham.....Providence, R. I.
30 William Henry Paine Hatch.....Cambridge
32 William Healy.....Boston
10 William Arthur Heidel.....Middletown, Conn.
21 William Ernest Hocking.....Cambridge
35 Clark Leonard Hull.....New Haven, Conn.
33 Walter Samuel Hunter.....Providence, R. I.
17 Frederick John Foakes Jackson..Englewood, N. J.
28 Albert Cornelius Knudson.....Cambridge
34 Kurt Koffka.....Northampton
32 Karl Spencer Lashley.....Belmont
13 William Lawrence.....Boston
29 Clarence Irving Lewis.....Lexington
33 Lee Sullivan McCollester.....Tufts College
10 Edward Caldwell Moore.....Cambridge
35 Henry Alexander Murray, Jr.....Boston
32 Arthur Darby Nock.....Cambridge
32 William Cardinal O'Connell.....Boston
28 Johnson O'Connor.....Boston
17 Charles Edwards Park.....Boston
33 Carroll Cornelius Pratt.....New Brunswick, N. J.
30 James Hugh Ryan.....Omaha, Neb.
31 Henry Knox Sherrill.....Boston
27 Willard Learoyd Sperry.....Cambridge
29 Russell Henry Stafford.....Brookline
34 Lewis Madison Terman..Stanford University, Cal.
34 Edward Lee Thorndike.....New York, N. Y.
37 Louis Leon Thurstone.....Chicago, Ill.
28 Henry Bradford Washburn.....Cambridge
17 John Broadus Watson.....New York, N. Y.
33 Frederic Lyman Wells.....Newton Highlands
35 Robert Sessions Woodworth.....New York, N. Y.
15 Robert Mearns Yerkes.....New Haven, Conn.

CLASS IV, SECTION II—*History, Archaeology, and Anthropology*—42

18 Charles McClean Andrews.....New Haven, Conn.
28 James Phinney Baxter, 3d.....Williamstown
23 Carl Lotus Becker.....Ithaca, N. Y.
27 Robert Pierpont Blake.....Cambridge
12 Franz Boas.....New York, N. Y.
39 Crane Brinton.....Cambridge
(25) 32 William Brooks Cabot.....Boston
34 Clarence Gordon Campbell.....New York, N. Y.
12 George Henry Chase.....Cambridge
21 Max Farrand.....San Marino, Cal.
21 William Scott Ferguson.....Cambridge
38 Allyn Bailey Forbes.....Cambridge
10 Worthington Chauncey Ford.....Cambridge
33 Henry Thatcher Fowler.....Providence, R. I.
38 Claude Moore Fuess.....Andover
18 Evarts Boutell Greene.....New York, N. Y.
19 Charles Downer Hazen.....New York, N. Y.
14 Bert Hodge Hill.....Athens, Greece
27 Earnest Albert Hooton.....Cambridge
33 Halford Lancaster Hoskins.....Tufts College
15 Aleš Hrdlička.....Washington, D. C.
12 Alfred Louis Kroeber.....Berkeley, Cal.
15 Kirsopp Lake.....Haverford, Pa.
22 George LaPiana.....Cambridge
32 Waldo Gifford Leland.....Washington, D. C.
20 Charles Howard McIlwain.....Belmont
14 Roger Bigelow Merriman.....Cambridge
38 Stewart Mitchell.....Gloucester
15 Samuel Eliot Morison.....Boston
34 Robert Henry Pfeiffer.....Cambridge
14 George Andrew Reisner.....Boston
34 David Moore Robinson.....Baltimore, Md.
23 Michael Ivanovich Rostovtzeff..New Haven, Conn.
27 George Sarton.....Cambridge
38 Bernadotte Everly Schmitt.....Chicago, Ill.
36 Donald Scott.....Cambridge
34 Theodore Leslie Shear.....Princeton, N. J.
26 Herbert Joseph Spinden.....Brooklyn, N. Y.
32 Charles Holt Taylor.....Cambridge
11 Alfred Marston Tozzer.....Cambridge
39 Henry Rouse Viets.....Dedham
20 Clark Wissler.....New York, N. Y.

CLASS IV, SECTION III—*Philology*—62

31 Edward Cooke Armstrong.....Princeton, N. J.
33 William Nickerson Bates.....Philadelphia, Pa.
35 Charles Henry Beeson.....Chicago, Ill.
33 Campbell Bonner.....Ann Arbor, Mich.
35 Robert Johnson Bonner.....Chicago, Ill.
33 Carleton Brown.....New York, N. Y.
21 Carl Darling Buck.....Chicago, Ill.
18 Edward Capps.....Princeton, N. J.
20 Walter Eugene Clark.....Cambridge
32 Ronald Salmon Crane.....Chicago, Ill.
32 Morris William Croll.....Princeton, N. J.
31 Samuel Hazzard Cross.....Cambridge
20 Franklin Edgerton.....New Haven, Conn.
40 Serge Elisséeff.....Cambridge
21 Frank Edgar Farley.....Middletown, Conn.
14 Jeremiah Denis Mathias Ford.....Cambridge
30 James Geddes, Jr.....Brookline
16 Louis Herbert Gray.....New York, N. Y.
25 William Chase Greene.....Cambridge
13 Charles Burton Gulick.....Cambridge
19 Roy Kenneth Hack.....Cincinnati, Ohio
34 Austin Morris Harmon.....New Haven, Conn.
31 Raymond Dexter Havens.....Baltimore, Md.
38 Richmond Laurin Hawkins.....Cambridge
18 George Lincoln Hendrickson...New Haven, Conn.
17 William Guild Howard.....Cambridge
21 Eugene Xavier Louis Henry Hyvernat, Wash., D.C.
15 Carl Newell Jackson.....Cambridge
40 Werner Wilhelm Jaeger.....Watertown
13 James Richard Jewett.....Cambridge
32 (Ralph) Hayward Keniston.....Chicago, Ill.
34 Roland Grubb Kent.....Wynnewood, Pa.
98 George Lyman Kittredge.....Cambridge
33 Hans Kurath.....Providence, R. I.
39 Henry Carrington Lancaster.....Baltimore, Md.
32 Ernest Felix Langley.....Cambridge
[81] 98 Charles Rockwell Lanman.....Cambridge
33 Ivan Mortimer Linforth.....Berkeley, Cal.
11 Albert Matthews.....Boston
35 Benjamin Dean Meritt.....Princeton, N. J.
28 William Albert Nitze.....Chicago, Ill.
32 George Rapall Noyes.....Berkeley, Cal.
34 William Abbott Oldfather.....Urbana, Ill.
33 Howard Rollin Patch.....Northampton
32 Arthur Stanley Pease.....Cambridge
35 Henry Washington Prescott.....Chicago, Ill.
13 Edward Kennard Rand.....Cambridge
11 Fred Norris Robinson.....Cambridge
38 Hyder Edward Rollins.....Cambridge
31 Robert Kilburn Root.....Princeton, N. J.
35 Henry Arthur Sanders.....Ann Arbor, Mich.
18 Rudolph Schevill.....Berkeley, Cal.
32 Horatio Elwin Smith.....New York, N. Y.
40 Edgar Howard Sturtevant.....New Haven, Conn.
39 John Strong Perry Tatlock.....Berkeley, Cal.
32 William Thomson.....Cambridge
11 Charles Cutler Torrey.....New Haven, Conn.
33 George Benson Weston.....Cambridge
30 Ernest Hatch Wilkins.....Oberlin, Ohio
33 Harry Austryn Wolfson.....Cambridge
39 William Hoyt Worrell.....Ann Arbor, Mich.
33 Karl Young.....New Haven, Conn.

CLASS IV, SECTION IV—*The Fine Arts and Belles Lettres*—51

31 Stephen Vincent Benét.....New York, N. Y.
26 Frank Weston Benson.....Salem
32 (William) Welles Bosworth.....New York, N. Y.
33 John Alden Carpenter.....Chicago, Ill.
32 Chalmers Dancy Clifton.....Westport, Conn.
32 Kenneth John Conant.....Cambridge

34 Charles Jay Connick ..... Newtonville
29 Charles Townsend Copeland ..... Cambridge
[17] 30 Ralph Adams Cram ..... Boston
33 Cyrus Edwin Dallin ..... Arlington Heights
34 Samuel Foster Damon ..... Providence, R. I.
32 George Harold Edgell ..... Cambridge
21 William Emerson ..... Cambridge
33 Carl Engel ..... New York, N. Y.
30 John Erskine ..... New York, N. Y.
10 Arthur Fairbanks ..... Hanover, N. H.
18 Edward Waldo Forbes ..... Cambridge
31 Robert Frost ..... South Shaftsbury, Vt.
27 Wallace Goodrich ..... Boston
36 William Clifford Heilman ..... Cambridge
29 Edward Burlingame Hill ..... Cambridge
31 Robert Silliman Hillyer ..... Cambridge
27 Charles Hopkinson ..... Manchester
12 Mark Antony DeWolfe Howe ..... Boston
38 Joseph Hudnut ..... Boston
18 Archer Milton Huntington ..... New York, N. Y.
31 Henry James ..... New York, N. Y.
(25) 32 William James ..... Cambridge
38 Howard Mumford Jones ..... Cambridge
33 Leo Rich Lewis ..... Tufts College
20 John Ellerton Lodge ..... Washington, D. C.
21 John Livingston Lowes ..... Cambridge
21 Charles Donagh Maginnis ..... Brookline
31 Paul Manship ..... New York, N. Y.
31 Daniel Gregory Mason ..... New York, N. Y.
31 Frank Jewett Mather ... Washington Crossing, Pa.
31 Kenneth Ballard Murdock ..... Cambridge
14 William Allan Neilson ..... Falls Village, Conn.
28 Curtis Hidden Page ..... Gilmanton, N. H.
21 William Lyon Phelps ..... New Haven, Conn.
(24) 32 Anthony John Philpott ..... Arlington
21 Chandler Rathfon Post ..... Cambridge
22 Paul Joseph Sachs ..... Cambridge
14 Ellery Sedgwick ..... Boston
19 Henry Dwight Sedgwick ..... Dedham
33 David Stanley Smith ..... Woodbridge, Conn.
35 Walter Raymond Spalding ..... Cambridge
39 Francis Henry Taylor ..... New York, N. Y.
39 Karl Ephraim Weston ..... Williamstown
38 Grenville Lindall Winthrop ..... Lenox
22 Charles Henry Conrad Wright ..... Cambridge

FOREIGN HONORARY MEMBERS—128

(Number limited to one hundred and thirty)

CLASS I—Mathematical and Physical Sciences—32

Section I—*Mathematics and Astronomy*—10

39 Arnaud Denjoy.....Paris
22 Sir Arthur Stanley Eddington Cambridge, England
34 Ronald Aylmer Fisher.....Harpenden, Herts
20 Jacques Salomon Hadamard.....Paris
21 Godfrey Harold Hardy.....Cambridge, England
27 Ejnar Hertzsprung.....Leyden
17 Tullio Levi-Civita.....Rome
03 Charles Émile Picard.....Paris
15 Charles Jean de la Vallée Poussin.....Louvain
29 Hermann Weyl.....Princeton, N. J.

Class I, Section II—*Physics*—8

29 Vilhelm Frimann Koren Bjerknes.....Oslo
24 Albert Einstein.....Princeton, N. J.
29 James Franck.....Baltimore, Md.
29 Abram F. Joffé.....Leningrad
03 Sir Joseph Larmor.....Cambridge, England
28 Friedrich Paschen.....Charlottenburg
14 Max Planck.....Berlin
02 Sir Joseph John Thomson....Cambridge, England

Class I, Section III—*Chemistry*—8

29 Johannes N. Brönsted.....Copenhagen
27 Peter Debye.....Berlin
33 Jaroslav Heyrovsky.....Prague
33 Fritz Paneth.....Durham
38 Leopold Ruzicka.....Zürich
38 Nevil Vincent Sidgwick.....Oxford
29 Heinrich Wieland.....Munich
34 Richard Willstätter..Muralto-Locarno, Switzerland

Class I, Section IV—*Technology and Engineering*—6

36 Edward Victor Appleton.....London
34 Luigi Lombardi.....Rome
29 Ludwig Prandtl.....Göttingen
29 Emil Probst.....Oxford
29 Aurel Stodola.....Zürich
31 Karl Willy Wagner.....Berlin

CLASS II—Natural and Physiological Sciences—31

Section I—*Geology, Mineralogy, and Physics of the Globe*—7

17 Frank Dawson Adams.....Montreal
36 Raoul Blanchard.....Grenoble, France
29 Léon William Collet.....Geneva
34 Arthur Holmes.....Durham
22 Emmanuel de Margerie.....Paris
21 Gustaf Adolf Frederik Molengraaff.....Delft
18 Sir William Napier Shaw.....London

Class II, Section II—*Botany*—6

32 Frederick Orpen Bower.....Ripon
31 Ludwig Diels.....Berlin
32 Kingo Miyabe.....Sapporo, Japan
29 Otto Renner.....Jena
32 Sir Albert Charles Seward.....London
35 Sir William Wright Smith.....Edinburgh

Class II, Section III—*Zoology and Physiology*—10

38 Edgar Douglas Adrian.....Cambridge, England
38 Sir Joseph Barcroft.....Cambridge, England
20 Maurice Caullery.....Paris
38 Emmanuel Fauré-Frémiet.....Paris
34 Archibald Vivian Hill.....London
31 August Krogh.....Copenhagen
30 Louis Édouard Lapicque.....Paris
28 Charles Tate Regan.....Feltham, Middlesex
33 Hans Spemann.....Freiburg i. Br.
28 Sir D'Arcy Wentworth Thompson....St. Andrews

Class II, Section IV—*Medicine and Surgery*—8

18 Sir Thomas Barlow, Bart.....London
39 Sir Aldo Castellani.....Rome
27 Sir Henry Hallett Dale.....London
33 Sir Arthur Keith.....London
28 Mikinosuke Miyajima.....Tokyo
27 Friedrich von Müller.....Munich
18 Sir Charles Scott Sherrington....Ipswich, England
36 (Jean) Hyacinthe Vincent.....Paris

CLASS III—The Social Arts—35

Section I—*Jurisprudence*—15

39 Rt. Hon. Lord Atkin.....London
38 William Warwick Buckland...Cambridge, England
38 Mircea Djuvara.....Bucharest
27 Léon Duguit.....Bordeaux
33 François Geny.....Nancy
38 Arthur Lehman Goodhart.....Oxford
39 Rt. Hon. Sir Wilfrid Arthur Greene.....London
39 Sir William Searle Holdsworth.....Oxford
33 Hans Kelsen.....Vienna
38 Rt. Hon. Lord Macmillan.....London
33 Juljusz Makarewicz.....Lwów
33 Rudolph Stammler.....Wernigerode a. H.
33 Giorgio Del Vecchio.....Rome
38 Rt. Hon. Lord Wright.....London
38 John C. H. Wu.....Hong Kong

SECTION II—*Government, International Law, and Diplomacy*—4

38 Dionisio Anzilotti . . . . . Rome
32 Paul Claudel . . . . . Paris
32 Hu Shih . . . . . Washington, D. C.
38 Kenzo Takayanagi . . . . . Tokyo

SECTION III—*Economics and Sociology*—12

32 Arthur Lyon Bowley . . . . . Haslemere, Surrey
34 Gustav Cassel . . . . . Djursholm, Sweden
39 Henry Clay . . . . . Kenley, Surrey
35 Luigi Einaudi . . . . . Turin
32 Ralph George Hawtrey . . . . . London
35 John Maynard Keynes . . . . . Cambridge, England
35 René Maunier . . . . . Paris
28 Arthur Cecil Pigou . . . . . Cambridge, England
32 Charles Rist . . . . . Fraisses (Loire)
33 Werner Sombart . . . . . Berlin
35 S. Rudolph Steinmetz . . . . . Amsterdam
34 Peter B. Struve . . . . . Belgrade

SECTION IV—*Administration and Affairs*—4

33 Gösta A. Bagge . . . . . Stockholm
38 Heinrich Brüning . . . . . Cambridge, Mass.
38 B. Seebohm Rowntree . . . . . North Dean, Bucks
33 Josiah Charles Stamp, Baron Stamp, Shortlands, Kent

CLASS IV—THE HUMANITIES—30

SECTION I—*Theology, Philosophy, and Psychology*—8

36 Miguel Asín y Palacios . . . . . Madrid
28 Henri Louis Bergson . . . . . Paris
28 Benedetto Croce . . . . . Naples
29 Étienne Gilson . . . . . Melun
28 Edmund Husserl . . . . . Freiburg i. B.
32 Pierre Janet . . . . . Paris
28 Wolfgang Köhler . . . . . Berlin
37 Henri Pieron . . . . . Paris

SECTION II—*History, Archaeology, and Anthropology*—6

33 Rafael Altamira y Crevea . . . . . Madrid
36 Marcel Aubert . . . . . Paris
29 Godfrey R. Benson, Baron Charnwood . . . . London
33 Friedrich Meinecke . . . . . Berlin-Dahlem
30 Sir Aurel Stein . . . . . Srinagar, Kashmir
31 George Macaulay Trevelyan . . Cambridge, England

SECTION III—*Philology*—6

09 Hermann Georg Jacobi . . . . . Bonn
36 Paul Kretschmer . . . . . Vienna
32 Paul Mazon . . . . . Paris
[12] 28 Hanns Oertel . . . . . Munich
17 Ramón Menéndez Pidal . . . . . Madrid
32 Frederick William Thomas . . . . . Oxford

SECTION IV—*The Fine Arts and Belles Lettres*—10

40 Fernand Baldensperger . . . . . Paris
30 Alfredo Casella . . . . . Rome
23 Henry Guy . . . . . Grenoble
29 Paul Hazard . . . . . Paris
40 Paul Hindemith . . . . . New Haven, Conn.
34 Serge Koussevitzky . . . . . Paris and Boston
27 Gilbert Murray . . . . . Oxford
31 Edgar Allison Peers . . . . . Liverpool
27 Henri Rabaud . . . . . Paris
40 Igor Strawinsky . . . . . Paris

ALPHABETICAL INDEX TO LISTS OF MEMBERS

The letters F and FHM refer to the lists of Fellows and Foreign Honorary Members, respectively. The class and section are indicated by the numerals following.

STATUTES AND STANDING VOTES.

STATUTES.

Adopted November 8, 1911: *amended May* 8, 1912, *January* 8, *and May* 14, 1913, *April* 14, 1915, *April* 12, 1916, *April* 10, 1918, *May* 14, 1919, *February* 8, *April* 12, *and December* 13, 1922, *February* 14, *March* 14, *and October* 10, 1923, *March* 10, 1926, *May* 9, 1928, *April* 8 *and November* 11, 1931, *April* 12, 1933, *February* 14, 1934, *December* 14, 1938, *January* 11, *April* 12, 1939 *and May* 8, 1940.

CHAPTER I.

THE CORPORATE SEAL.

ARTICLE 1. The Corporate Seal of the Academy shall be as here depicted:

ARTICLE 2. The Recording Secretary shall have the custody of the Corporate Seal.

See Chap. v, art. 3; chap. vi, art. 2.

CHAPTER II.

FELLOWS AND FOREIGN HONORARY MEMBERS AND DUES.

ARTICLE 1. The Academy consists of Fellows, who are either citizens or residents of the United States of America, and Foreign Honorary Members. They are arranged in four Classes, according to the Arts and Sciences in which they are severally proficient, and each Class is divided into four Sections, namely:

CLASS I. *The Mathematical and Physical Sciences*

Section 1. Mathematics and Astronomy
Section 2. Physics
Section 3. Chemistry
Section 4. Technology and Engineering

CLASS II. *The Natural and Physiological Sciences*

Section 1. Geology, Mineralogy, and Physics of the Globe
Section 2. Botany
Section 3. Zoölogy and Physiology
Section 4. Medicine and Surgery

CLASS III. *The Social Arts*

Section 1. Jurisprudence
Section 2. Government, International Law, and Diplomacy
Section 3. Economics and Sociology
Section 4. Administration and Affairs

CLASS IV. *The Humanities*

Section 1. Theology, Philosophy, and Psychology
Section 2. History, Archæology, and Anthropology
Section 3. Philology
Section 4. The Fine Arts and Belles Lettres

ARTICLE 2. The number of Fellows shall not exceed Eight hundred, of whom not more than Six hundred shall be residents of Massachusetts, nor shall there be more than Two hundred and twenty in any one Class.

ARTICLE 3. The number of Foreign Honorary Members shall not exceed One hundred and thirty. They shall be chosen from among citizens of foreign countries most eminent for their discoveries and attainments in any of the Classes above enumerated. There shall not be more than Thirty-five in any one Class.

ARTICLE 4. If any person, after being notified of his election as Fellow, shall neglect for six months to accept in writing, or, if a Fellow resident within fifty miles of Boston shall neglect to pay his Admission Fee, his election shall be void; and if any Fellow resident within fifty miles of Boston shall neglect to pay his Annual Dues for six months after they are due, provided his attention shall have been called to this Article of the Statutes in the meantime, he shall cease to be a Fellow; but the Council may suspend the provisions of this Article for a reasonable time

With the previous consent of the Council, the Treasurer may dispense (*sub silentio*) with the payment of the Admission Fee or of the Annual Dues or both whenever he shall deem it advisable. In the case of officers of the Army or Navy who are out of the Commonwealth on duty, payment of the Annual Dues may be waived during such absence if continued during the whole financial year and if notification of such expected absence be sent to the Treasurer. Upon similar notification to the Treasurer, similar exemption may be accorded to Fellows subject to Annual Dues, who may temporarily remove their residence for at least two years to a place more than fifty miles from Boston.

If any person elected a Foreign Honorary Member shall neglect for six months after being notified of his election to accept in writing, his election shall be void.

See Chap. vii, art. 2.

ARTICLE 5. Every Fellow resident within fifty miles of Boston hereafter elected shall pay an Admission Fee of Ten dollars, unless previously as an Associate he has paid an Admission Fee of like amount.

Every Fellow resident within fifty miles of Boston shall, and others may, pay such Annual Dues, not exceeding Fifteen dollars, as shall be voted by the Academy at each Annual Meeting, when they shall become due; but any Fellow shall be exempt from the annual payment if, at any time after his admission, he shall pay into the treasury Two hundred dollars in addition to his previous payments. Any Fellow shall also be exempt from Annual Dues who has paid such dues for forty years, or, having attained the age of seventy-five has paid dues for twenty-five years.

Fellows residing more than fifty miles from Boston elected after 1938 shall, and other non-resident Fellows may, pay annual dues of five dollars, which shall entitle them to all privileges of resident Fellows.

All Commutations of the Annual Dues shall be and remain permanently funded, the interest only to be used for current expenses.

Any Fellow not previously subject to Annual Dues who takes up his residence within fifty miles of Boston, shall pay to the treasurer within three months thereafter Annual Dues for the current year, failing which his Fellowship shall cease; but the Council may suspend the provisions of this Article for a reasonable time.

Only Fellows who pay Annual Dues or have commuted them may hold office in the Academy or serve on the Standing Committees or vote at meetings.

ARTICLE 6. Fellows who pay or have commuted the Annual Dues and Foreign Honorary Members shall be entitled to receive gratis one copy of all numbers of the Proceedings and Memoirs of the Academy which have been issued after their election.

See Chap. xi, art. 2.

ARTICLE 7. Diplomas signed by the President and the Vice-President of the Class to which the member belongs, and countersigned by the Secretaries, shall be given to Foreign Honorary Members and to Fellows.

ARTICLE 8. If, in the opinion of a majority of the entire Council, any Fellow or Foreign

Honorary Member shall have rendered himself unworthy of a place in the Academy, the Council shall recommend to the Academy the termination of his membership; and if three-fourths of the Fellows present, out of a total attendance of not less than fifty at a Stated Meeting, or at a Special Meeting called for the purpose, shall adopt this recommendation, his name shall be stricken from the Roll.

See Chap. iii; chap. vi, art. 1; chap. x, art. 1; chap. xi, art. 2.

CHAPTER III.

Election of Fellows and Foreign Honorary Members.

The procedure in the election of Fellows and Foreign Honorary Members shall be as follows:

Nominations to Fellowship or Foreign Honorary Membership in any Section must be signed by two Fellows of that Section, or by three Fellows of any Section, and sent to the Corresponding Secretary accompanied by a statement of the qualifications of the nominee and brief biographical data.

Notice shall be sent to every Fellow not later than the fifteenth of January in each year, reminding him that all nominations must be in the hands of the Corresponding Secretary before the first of February following.

The Corresponding Secretary shall, on the second of February, transmit to the several Vice-Presidents the nominations for Fellows and Foreign Honorary Members in their respective classes. Each Class Committee shall, before the sixteenth of February, consider the nominations, and may add others for the purpose of securing proper membership in the Academy, to the end that those in the country of highest distinction in their several classes may be Fellows.

A list of the nominees, giving a brief account of each, with the names of the nominators, shall be sent to every Fellow with a request that he return the list with such confidential comments and indications of preference as he may choose to make.

All the nominations, with any comments thereon and with expressions of preference on the part of the Fellows, shall be referred to the appropriate Class Committees, which shall canvass them, and report their recommendations in writing to the Council before the Stated Meeting of the Academy in April.

Elections of Fellows and Foreign Honorary Members shall be made by the Council before the Annual Meeting in May, and announced at that meeting.

Persons nominated in any year, but not elected, may be carried over to the list of nominees for the next year at the discretion of the Council, but shall not be further continued unless renominated.

See Chap. ii; chap. vi, art. 1; chap. x, art. 1.

CHAPTER IV.

Officers.

Article 1. The Officers of the Academy shall be a President (who shall be Chairman of the Council), four Vice-Presidents (one from each Class), a Corresponding Secretary (who shall be Secretary of the Council), a Recording Secretary, a Treasurer, a Librarian, and an Editor, all of whom shall be elected by ballot at the Annual Meeting, and shall hold their respective offices for one year, and until others are duly chosen and installed.

There shall be also sixteen Councillors, one from each Section of each Class. At each Annual Meeting four Councillors, one from each Class, shall be elected by ballot to serve for the full term of four years and until others are duly chosen and installed. The same Fellows shall not be eligible for two successive terms.

The Councillors, with the officers previously named, and the Chairmen of the House Committee and the Committee on Resources and Policy, *ex officiis*, shall constitute the Council.

See Chap. xi, art. 1.

Article 2. If any officer be unable, through death, absence, or disability, to fulfill the duties of his office, or if he shall resign, his place may be filled by the Council in its

discretion for any part or the whole of the unexpired term.

ARTICLE 3. At the Stated Meeting in March, the President shall appoint a Nominating Committee of four Fellows having the right to vote, one from each Class. This Committee shall prepare a list of nominees for the several offices to be filled, and for the Standing Committees, and file it with the Recording Secretary not later than four weeks before the Annual Meeting.

See Chap. vi, art. 2.

ARTICLE 4. Independent nominations for any office, if signed by at least twenty Fellows having the right to vote, and received by the Recording Secretary not less than ten days before the Annual Meeting, shall be inserted in the call therefor, and shall be mailed to all the Fellows having the right to vote.

See Chap. vi, art. 2.

ARTICLE 5. The Recording Secretary shall prepare for use in voting at the Annual Meeting a ballot containing the names of all persons duly nominated for office.

CHAPTER V.

THE PRESIDENT.

ARTICLE 1. The President, or in his absence the senior Vice-President present (seniority to be determined by length of continuous Fellowship in the Academy), shall preside at all meetings of the Academy. In the absence of all these officers, a Chairman of the meeting shall be chosen by ballot.

ARTICLE 2. Unless otherwise ordered, all Committees which are not elected by ballot shall be appointed by the presiding officer.

ARTICLE 3. Any deed or writing to which the Corporate Seal is to be affixed, except leases of real estate, shall be executed in the name of the Academy by the President or, in the event of his death, absence, or inability, by one of the Vice-Presidents, when thereto duly authorized.

See Chap. ii, art. 7; chap. iv, art. 1, 3; chap. vi, art. 2; chap. vii, art. 1; chap. x, art. 6; chap. xi, art. 1, 2; chap. xii, art. 1.

CHAPTER VI.

THE SECRETARIES.

ARTICLE 1. The Corresponding Secretary shall conduct the correspondence of the Academy and of the Council, recording or making an entry of all letters written in its name, and preserving for the files all official papers which may be received. At each meeting of the Council he shall present the communications addressed to the Academy which have been received since the previous meeting, and at the next meeting of the Academy he shall present such as the Council may determine.

He shall notify all persons who may be elected Fellows or Foreign Honorary Members, send to each a copy of the Statutes, and on their acceptance issue the proper Diploma. He shall also notify all meetings of the Council; and in case of the death, absence, or inability of the Recording Secretary he shall notify all meetings of the Academy.

Under the direction of the Council, he shall keep a List of the Fellows and Foreign Honorary Members, arranged in their several Classes and Sections. It shall be printed annually and issued as of the first day of July.

See Chap. ii, art. 7; chap. iii; chap. iv, art. 1; chap. x, art. 6; chap. xi, art. 1; chap. xii, art. 1.

ARTICLE 2. The Recording Secretary shall have the custody of the Charter, Corporate Seal, Archives, Statute-Book, Journals, and all literary papers belonging to the Academy.

Fellows borrowing such papers or documents shall receipt for them to their custodian.

The Recording Secretary shall attend the meetings of the Academy and keep a faithful record of the proceedings with the names of the Fellows present; and after each meeting is duly opened, he shall read the record of the preceding meeting.

He shall notify the meetings of the Academy to each Fellow and by mail at least seven days beforehand, and in his discretion may also cause the meetings to be advertised; he shall apprise Officers and Committees of their election or appointment, and inform the Treasurer of appropriations of money voted by the Academy.

After all elections, he shall insert in the Records the names of the Fellows by whom the successful nominees were proposed.

He shall send the Report of the Nominating Committee in print to every Fellow having the right to vote at least three weeks before the Annual Meeting.

See Chap. iv, art. 3.

In the absence of the President and of the Vice-President he shall, if present, call the meeting to order, and preside until a Chairman is chosen.

See Chap. i; chap. ii, art. 7; chap. iv, art. 3, 4, 5; chap. x, art. 6; chap. xi, art. 1, 2; chap. xii, art. 1, 3.

ARTICLE 3. The Secretaries, with the Editor, shall have authority to publish such of the records of the meetings of the Academy as may seem to them likely to promote its interests.

CHAPTER VII.

THE TREASURER AND THE TREASURY.

ARTICLE 1. The Treasurer shall collect all money due or payable to the Academy and all gifts or bequests made to it. He shall pay all bills due and payable by the Academy when approved by the proper officers. He shall sign all leases of real estate in the name of the Academy. He shall be the official custodian of all bonds, stocks and other securities and, with the written approval of any one member of the Committee on Finance, he shall have full authority to sell and transfer, invest and reinvest from time to time in such manner and upon such terms as shall to him seem best, the whole or any part of the personal property of the said Academy.

He shall keep a faithful account of all receipts and expenditures, submit his acounts annually to the Auditing Committee, and render them at the expiration of his term of office, or whenever required to do so by the Academy or the Council.

He shall keep separate accounts of the income of the Rumford Fund, and of all other special Funds, and of the Appropriation thereof, and render them annually.

His accounts shall always be open to the inspection of the Council.

ARTICLE 2. He shall report annually to the Council at its March meeting on the expected income of the various Funds and from all other sources during the ensuing financial year. He shall also report the names of all Fellows who may be then delinquent in the payment of their Annual Dues.

ARTICLE 3. He shall give such security for the trust reposed in him as the Academy may require.

ARTICLE 4. With the approval of a majority of the Committee on Finance, he may appoint an Assistant Treasurer to perform his duties, for whose acts, as such assistant, he shall be responsible; or, with like approval and responsibility, he may employ any Trust Company doing business in Boston as his agent for the same purpose, the compensation of such Assistant Treasurer or agent to be fixed by the Committee on Finance and paid from the Funds of the Academy.

ARTICLE 5. At the Annual Meeting he shall report in print all his official doings for the preceding year, stating the amount and condition of all the property of the Academy entrusted to him, and the character of the investments.

ARTICLE 6. The Financial Year of the Academy shall begin with the first day of April.

ARTICLE 7. No person or committee shall incur any debt or liability in the name of the Academy, unless in accordance with a previous vote and appropriation therefor by the Academy or the Council, or sell or otherwise dispose of any property of the Academy, except cash or invested funds, without previous consent and approval of the Council.

See Chap. ii, art. 4, 5; chap. vi, art. 2; chap. x, art. 6; chap. xi, art. 1, 2, 3; chap. xii, art. 1.

CHAPTER VIII.

THE LIBRARIAN AND THE LIBRARY.

ARTICLE 1. The Librarian shall have charge of the printed books, keep a correct

catalogue thereof, and provide for their delivery from the Library.

At the Annual Meeting, as Chairman of the Committee on the Library, he shall make a Report on its condition.

ARTICLE 2. In conjunction with the Committee on the Library he shall have authority to expend such sums as may be appropriated by the Academy for the purchase of books, periodicals, etc., and for defraying other necessary expenses connected with the Library.

ARTICLE 3. All books procured from the income of the Rumford Fund or of other special Funds shall contain a book-plate expressing the fact.

ARTICLE 4. Books taken from the Library shall be receipted for to the Librarian or his assistant.

ARTICLE 5. Books shall be returned in good order, regard being had to necessary wear with good usage. If any book shall be lost or injured, the Fellow to whom it stands charged shall replace it by a new volume or by a new set, if it belongs to a set, or pay the current price thereof to the Librarian, whereupon the remainder of the set, if any, shall be delivered to the Fellow so paying, unless such remainder be valuable by reason of association.

ARTICLE 6. All books shall be returned to the Library for examination at least one week before the Annual Meeting.

ARTICLE 7. The Librarian shall have the custody of the Publications of the Academy. With the advice and consent of the President, he may effect exchanges with other associations.

See Chap. ii, art. 6; chap. xi, art. 1, 2.

CHAPTER IX.

THE EDITOR AND THE PUBLICATIONS.

ARTICLE 1. The Editor shall have charge of the conduct through the press of the Proceedings and the Memoirs, and all correspondence relative thereto, and shall have power to fix the price at which individual numbers of the Proceedings and Memoirs are sold.

The Editor shall select as Associate Editor one member of the Committee of Publication, and the Associate Editor shall assist the Editor in the duties of his office in such way as the two shall find most convenient.

ARTICLE 2. In conjunction with the Committee of Publication, the Editor shall have authority to expend such sums as may be appropriated by the Academy for printing the publications and for defraying other expenses therewith connected.

ARTICLE 3. All publications which are financed in whole or in part from the income of the Rumford Fund or from the income of other special funds, and all publications of work done with the aid of the Rumford Fund or other special funds, shall contain a conspicuous statement of this fact.

ARTICLE 4. Two hundred extra copies of each paper printed in the Proceedings or Memoirs shall be placed at the disposal of the author without charge.

If, on account of the number of communications offered for publication, it shall be necessary to decline for publication communications otherwise acceptable, members of the Academy shall be given preference in each of the several Classes over non-members; but whenever it shall be necessary to exercise this preference, the Editor shall inform the Council of the fact.

See Chap. iv, art. 1; chap. vi, art. 3; chap. x, art. 6; chap. xi, art. 2, sect. 5.

CHAPTER X.

THE COUNCIL.

ARTICLE 1. The Council shall exercise a discreet supervision over all nominations and elections to membership, and in general supervise all the affairs of the Academy not explicitly reserved to the Academy as a whole

or entrusted by it or by the Statutes to standing or special committees.

It shall consider all nominations duly sent to it by any Class Committee, and act upon them in accordance with the provisions of Chapter III.

With the consent of the Fellow interested, it shall have power to make transfers between the several Sections, reporting its action to the Academy.

See Chap. iii; chap. xi, art. 1.

ARTICLE 2. Nine members shall constitute a quorum.

ARTICLE 3. It shall establish rules and regulations for the transaction of its business, and provide all printed and engraved blanks and books of record.

ARTICLE 4. It shall act upon all resignations of officers, and all resignations and forfeitures of Fellowship; and cause the Statutes to be faithfully executed.

It shall appoint all agents and subordinates not otherwise provided for by the Statutes, prescribe their duties, and fix their compensation. They shall hold their respective positions during the pleasure of the Council.

ARTICLE 5. It may appoint, for terms not exceeding one year, and prescribe the functions of, such committees of its number, or of the Fellows of the Academy, as it may deem expedient, to facilitate the administration of the affairs of the Academy or to promote its interests.

ARTICLE 6. At its March meeting it shall receive reports from the President, the Secretaries, the Treasurer, and the Standing Committees, on the appropriations severally needed for the ensuing financial year. At the same meeting the Treasurer shall report on the expected income of the various Funds and from all other sources during the same year.

A report from the Council shall be submitted to the Academy, for action, at the March meeting, recommending the appropriation which in the opinion of the Council should be made.

On the recommendation of the Council, special appropriations may be made at any Stated Meeting of the Academy, or at a Special Meeting called for the purpose.

See Chap. xi, art. 3.

ARTICLE 7. It shall report at every meeting of the Academy such business as it may deem advisable to present.

See Chap. ii, art. 4, 5, 8; chap. iv, art. 1, 2; chap. vi, art. 1; chap. vii, art. 1; chap. xii, art. 1, 4.

CHAPTER XI.

STANDING COMMITTEES.

ARTICLE 1. The Class Committee of each Class shall consist of the Vice-President, who shall be chairman, and the four Councillors of the Class, together with such other officer or officers annually elected as may belong to the Class. It shall consider nominations to Fellowship in its own Class, and report in writing to the Council such as may receive at a Class Committee Meeting a majority of the votes cast, provided at least three shall have been in the affirmative.

See Chap. iii.

ARTICLE 2. At the Annual Meeting the following Standing Committees shall be elected by ballot to serve for the ensuing year.

(i) *The Committee on Finance*, to consist of four Fellows, who shall have general oversight of the funds and investments of the Academy.

See Chap. iv, art. 3; chap. vii, art. 1, 4; chap. x, art. 6.

(ii) *The Committee on Policy and Resources* to consist of five Fellows and the President, *ex officio*, one of the five elected members to be elected each year to serve for a term of five years, except that the five elected in 1939 shall be elected for terms of one, two, three, four, and five years respectively, the Committee to concern itself with procuring funds for the Academy, to study the activities and needs of the Academy, and to recommend, for the approval of the Coun-

cil, means by which the functions and purposes of the Academy may best be fulfilled.

(iii) *The Rumford Committee,* to consist of seven Fellows, who shall report to the Academy on all applications and claims for the Rumford Premium. It alone shall authorize the purchase of books, publications and apparatus at the charge of the income from the Rumford Fund, and generally shall see to the proper execution of the trust.

See Chap. iv, art. 3; chap. x, art. 6.

(iv) *The Cyrus Moors Warren Committee,* to consist of seven Fellows, who shall consider all applications for appropriations from the income of the Cyrus Moors Warren Fund, and generally shall see to the proper execution of the trust.

See Chap. iv, art. 3; chap. x, art. 6.

(v) *The Committee of Publication,* to consist of the Editor, *ex officio,* as Chairman, and four other Fellows, one from each Class, to whom all communications submitted to the Academy for publication shall be referred, and to whom the printing of the Proceedings and the Memoirs shall be entrusted.

It shall fix the price at which volumes of the publications shall be sold, but Fellows may be supplied at half price with volumes and with single publications which they are not entitled to receive gratis.

It shall determine when the pressure of material offered for publication makes it necessary to give preference to members of the Academy as compared with non-members, or to give priority to certain members as compared with others, and to what extent this preference or priority shall be applied in each of the four Classes, to the end that a proper balance of the facilities of publication with respect to subject matter and authors may be maintained.

See Chap. iv, art. 3; chap. vi, art. 1, 3; chap. ix; chap. x, art. 6.

(vi) *The Committee on the Library,* to consist of the Librarian, *ex officio,* as Chairman, and four other Fellows, one from each Class, who shall examine the Library and make an annual report on its condition and management.

See Chap. iv, art. 3; chap. viii, art. 1, 2; chap. x, art. 6.

(vii) *The House Committee,* to consist of four Fellows, who shall have charge of all expenses connected with the House, including the general expenses of the Academy not specifically assigned to the care of other Committees or Officers.

See Chap. iv, art. 1, 3; chap. x, art. 6.

(viii) *The Committee on Meetings,* to consist of the President, the Recording Secretary, and four other Fellows, who shall have charge of plans for meetings of the Academy.

See Chap. iv, art. 3; chap. x, art. 6.

(ix) *The Auditing Committee,* to consist of two Fellows, who shall audit the accounts of the Treasurer, with power to employ an expert and to approve his bill.

See Chap. iv, art. 3; chap. vii, art. 1; chap. x, art. 6.

(x) *The Committee on Biographical Notices,* to consist of six Fellows, two to be elected each year, one of them to be a Secretary of the Academy, to see that biographical notices of the Fellows are provided.

After the death of a Fellow or Foreign Honorary Member, it shall appoint a member of the Academy to provide a biographical notice for publication in the Proceedings.

ARTICLE 3. The Standing Committees shall report annually to the Council in March on the appropriations severally needed for the ensuing financial year; and all bills incurred on account of these Committees, within the limits of the several appropriations made by the Academy, shall be approved by their respective Chairmen.

In the absence of the Chairman of any Committee, bills may be approved by any member of the Committee whom he shall designate for the purpose.

See Chap. vii, art. 1, 7; chap. x, art. 6.

CHAPTER XII.

Meetings, Communications, and Amendments.

Article 1. There shall be annually eight Stated Meetings of the Academy, namely, on the second Wednesday of October, November, December, January, February, March, April, and May. Only at these meetings, or at adjournments thereof regularly notified, or at Special Meetings called for the purpose, shall appropriations of money be made or amendments of the Statutes or Standing Votes be effected.

The Stated Meeting in May shall be the Annual Meeting of the Corporation.

Special Meetings shall be called by either of the Secretaries at the request of the President, of a Vice-President, of the Council, or of ten Fellows having the right to vote; and notifications thereof shall state the purpose for which the meeting is called.

The Council shall have authority, as occasion may demand, to arrange additional meetings and to cancel any of the Statutory meetings, except that meetings for transacting business shall be held as required by the Statutes.

Article 2. Twenty-five Fellows having the right to vote shall constitute a quorum for the transaction of business at Stated or Special Meetings. Eighteen Fellows shall be sufficient to constitute a meeting for literary or scientific communications and discussions.

Article 3. Upon the request of the presiding officer or the Recording Secretary, any motion or resolution offered at any meeting shall be submitted in writing.

Article 4. No report of any paper presented at a meeting of the Academy shall be published by any Fellow without the consent of the author; and no report shall in any case be published by any Fellow in a newspaper as an account of the proceedings of the Academy without the previous consent and approval of the Council. The Council, in its discretion, by a duly recorded vote, may delegate its authority in this regard to one or more of its members.

Article 5. Fellows may introduce guests at any of the literary or scientific meetings of the Academy.

Article 6. The Academy shall not express its judgment on literary or scientific memoirs or performances submitted to it, or included in its Publications.

Article 7. All proposed Amendments of the Statutes shall be referred to a committee, and on its report, at a subsequent Stated Meeting or at a Special Meeting called for the purpose, two-thirds of the ballots cast, and not less than twenty-five, must be affirmative to effect enactment.

Article 8. Standing Votes may be passed, amended, or rescinded at a Stated Meeting, or at a Special Meeting called for the purpose, by a vote of two-thirds of the members present. They may be suspended by a unanimous vote.

See Chap. ii, art. 5, 8; chap. iii; chap. iv, art. 3, 4, 5; chap. v. art. 1; chap. vi, art. 1, 2; chap. x, art. 7.

STANDING VOTES

1. Communications of which notice has been given to either of the Secretaries shall take precedence of those not so notified.

2. Fellows may take from the Library six volumes at any one time, and may retain them for three months, and no longer. Upon special application, and for adequate reasons assigned, the Librarian may permit a larger number of volumes, not exceeding twelve, to be drawn from the Library for a limited period.

3. Works published in numbers, when unbound, shall not be taken from the Hall of the Academy without the leave of the Librarian.

4. Communications offered for publication in the Proceedings or Memoirs of the Academy shall not be accepted for publication before the author either himself or through some agent, shall have informed the Committee on Meetings of his readiness to use such time as the Committee may assign him at such meeting as may be convenient both to him and to the Committee, for the purpose of presenting to the Academy a general statement of the nature and significance of the results contained in his communication.

RUMFORD PREMIUM

In conformity with the terms of the gift of Sir Benjamin Thompson, Count Rumford, of a certain Fund to the American Academy of Arts and Sciences, and with a decree of the Supreme Judicial Court of Massachusetts for carrying into effect the general charitable intent and purpose of Count Rumford, as expressed in his letter of gift, the Academy is empowered to make from the income of the Rumford Fund, as it now exists, at any Annual Meeting, an award of a gold and a silver medal, being together of the intrinsic value of three hundred dollars, as a Premium to the author of any important discovery or useful improvement in light or heat, which shall have been made and published by printing, or in any way made known to the public, in any part of the continent of America, or any of the American islands; preference always being given to such discoveries as, in the opinion of the Academy, shall tend most to promote the good of mankind; and, if the Academy sees fit, to add to such medals, as a further Premium for such discovery and improvement, a sum of money not exceeding three hundred dollars.

PERMANENT SCIENCE FUND

By an Agreement and Declaration of Trust dated Sept. 5, 1928, the BOSTON SAFE DEPOSIT AND TRUST COMPANY agrees to accept and hold gifts made to it as Trustee of the PERMANENT SCIENCE FUND . . . and to pay the income . . . to the AMERICAN ACADEMY OF ARTS AND SCIENCES, to be applied to such scientific research "as shall be deemed charitable within the broadest possible construction of that term" . . . in such sciences as Mathematics, Physics, Chemistry, Astronomy, Geology, Geography, Zoology, Botany, Anthropology, Psychology, Sociology and Economy, History and Philology, Engineering, Medicine and Surgery, Agriculture, Manufacture and Commerce, Education and any other science of any nature or description whether or not now known or now recognized as scientific; and may be applied to or through public or private associations, societies or institutions, . . . or to or through one or more individuals.

Disbursements from income are voted by the Council of the Academy upon recommendations from the Committee on the Permanent Science Fund. A brochure comprising the First Decennial Report on the history and activities of this committee and a copy of the Agreement and Declaration of Trust is available on request to the Trustee at 100 Franklin Street, Boston, Mass.